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Contents 367. Advertising Index 51

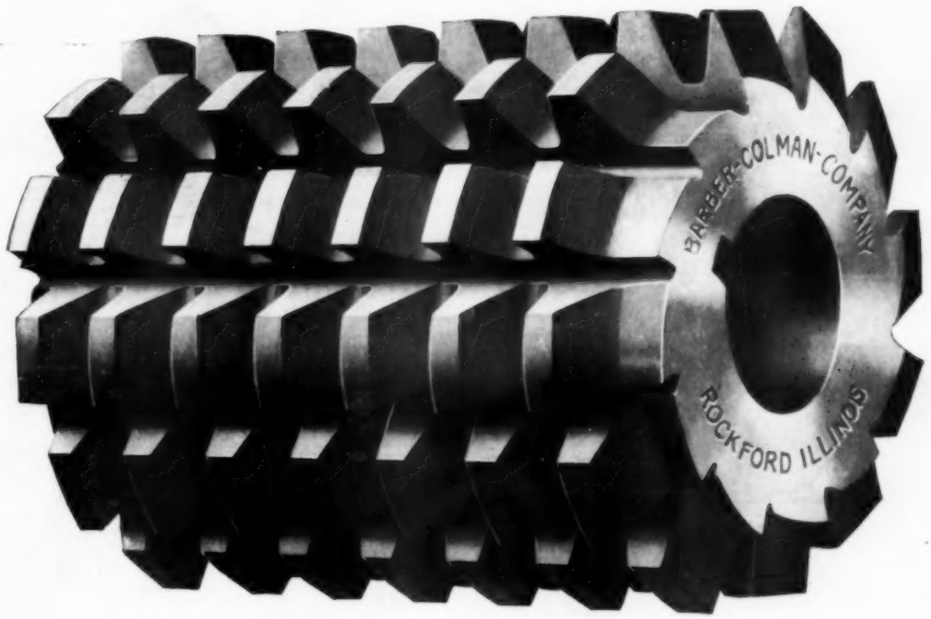
COMPLETE LINE

MILLING CUTTERS

AND

SPUR GEAR HOBS

CARBON AND HIGH SPEED STEEL



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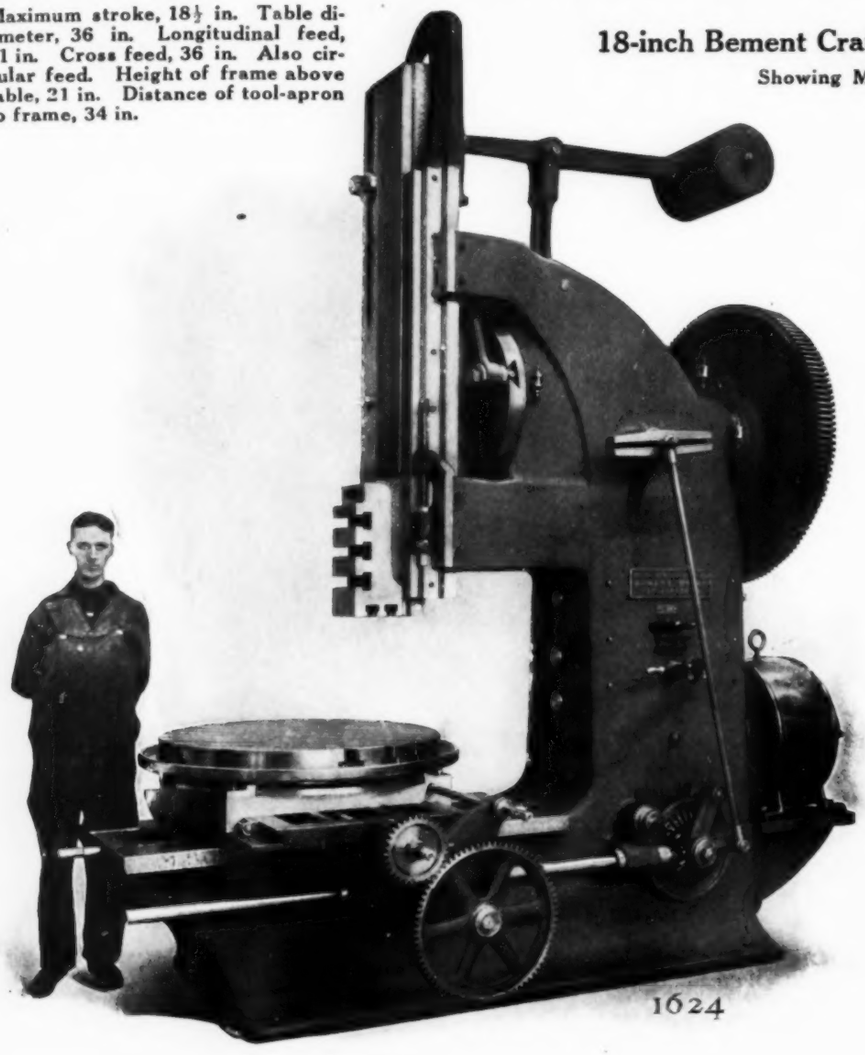

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(*See pages* 43, 44, 45 *and* 46)

Making "Trimo" Tools

Editorial Correspondence

A plant that was developed amid difficulties after a disastrous fire of a few years ago. An extensive use of air-operated tools.

The interesting plant where "Trimo" tools are produced is not so well known to our readers as the tools themselves. This plant is of interest for several reasons. Some five years ago the factory buildings of the Trimont Manufacturing Company, in Roxbury, Mass., the maker of "Trimo" tools, were burned to the ground entailing a loss of both buildings and equipment. Just before the fire the firm had purchased a tract of land with some buildings that had been built and used for a brewery. The thought in mind was that ultimately these old buildings would be pulled down and an extension to the plant erected in place of them.

But the disastrous fire changed these plans completely. It was necessary to begin to manufacture at once to take care of an extensive trade. The old brewery building was transformed into a machine shop; while the brick building that had once sheltered the brewery horses became the drop-forging department.

Thus this plant shows the successful adaptation of a type of architecture not in the least suited for manufacturing, to the purpose of making wrenches, pipe cutters and similar tools.

Again, a great deal of thought and care has been spent in the design of special manufacturing tools and processes, in order that all parts of the product may be interchangeable, may be produced in large quantities, may be carefully inspected at all stages of manufacture, and finally turned out as a finished product that will stand the test of discriminating use.

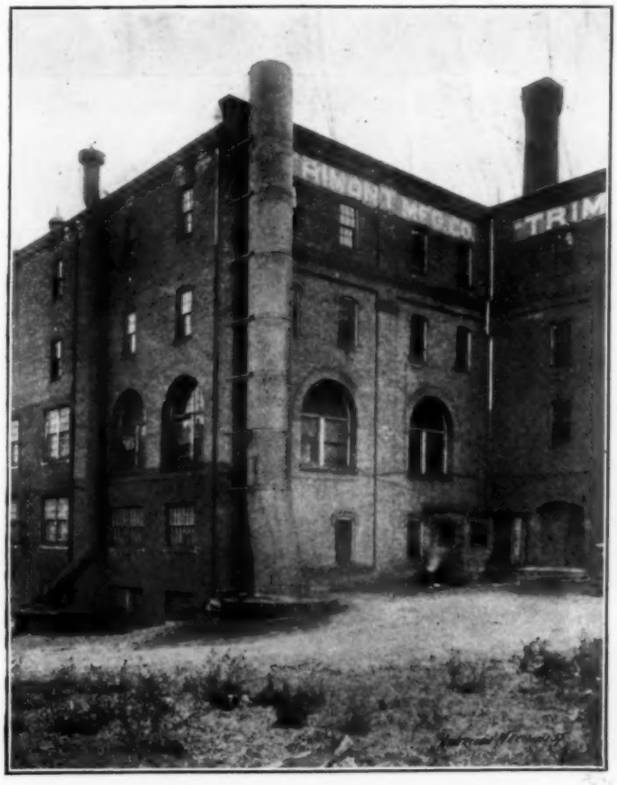

FIG. 1. FRONT OF MAIN BUILDING OF TRIMONT MANUFACTURING COMPANY

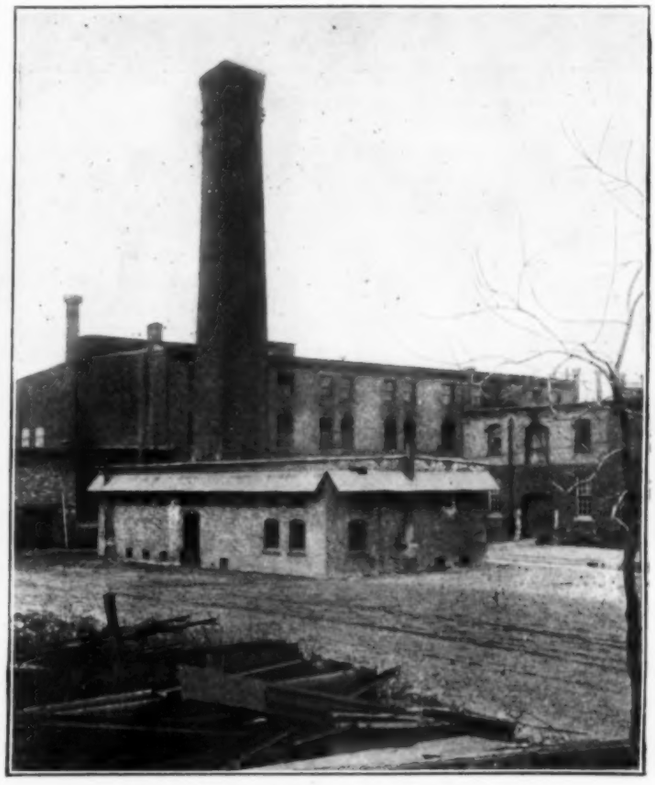

FIG. 2. HARDENING ROOM IN FRONT—FORGE SHOP IN REAR

Fig. 1 shows the machine-shop building, the building that was formerly the brew house, and Fig. 2 shows in the foreground the hardening room, a small, low detached building of recent construction, and behind it the old brewery stable, now the forge shop.

At the near corner of the machine-shop building will be noticed a large pipe running upward to a point a few feet above the roof. This pipe is the vent for the exhausters that handle the dust from the polishing and grinding rooms. Beneath the vertical pipe is a cylindrical chamber inclosed with brick walls, having a diameter of some 10 feet, a hight of about the same, and partially filled with water. Into this chamber dust from the grinding and polishing machines is blown; the heavy particles of emery and steel are taken up by the water, and the large pipe running through to the roof forms a free vent. At stated intervals, once in about two weeks, the accumulation of dirt in the chamber is removed outside of regular working hours. Other views show the interior of the grinding and polishing rooms, and indicate the success with which the dust is removed.

The hardening room is of interest for its construction, with a series of ventilating windows just under the roof, shielded by corrugated-iron screens to keep the interior dark, and individual ventilating pipes running from each furnace upward to a point a few feet above the roof. I can say from my own observation that the interior of this room is free from gas, heat and smoke, and represents good working conditions.

THE STORAGE OF BAR STOCK

Bar stock piled up like scantlings, is an unusual sight; yet in Fig. 3 we see a

corner of the rough-stock room of this plant, where steel is in piles extending from floor to the lower side of the roof truss chords. Here 1000 tons or more of steel, much of it of special alloy, are kept in storage in order to meet the needs of the business.

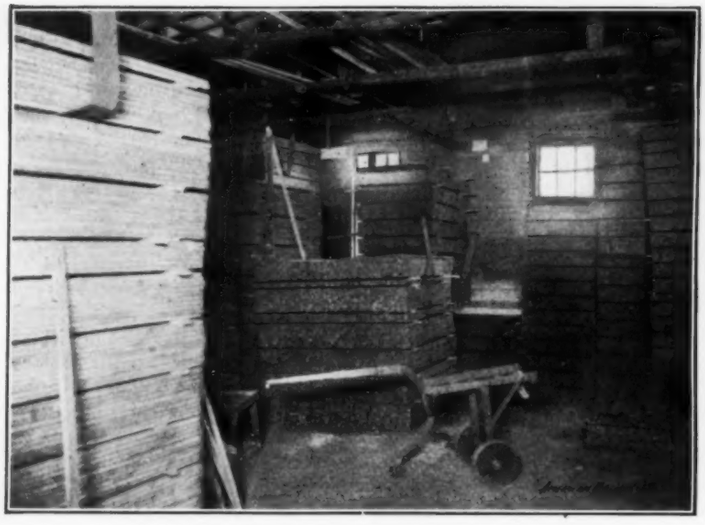

FIG. 3. BAR STEEL STORAGE

FIG. 4. FORGE SHOP WITH MONO-RAIL CRANE

In the foreground will be seen a truck used to carry bars from this place of storage into the forge shop; its convenience is at once apparent.

DROP FORGING SHOP

Figs. 4 and 5 show us the drop-forging shop. In Fig. 4, in the central part of the illustration, is seen a large mono-rail jib crane which can be run the entire length of the room and swung around in order to handle any part of the large hammers and their equipment of dies and tools. This crane is electrically operated, the motors and controlling devices being arranged on the truck at the foot of the column.

Fig. 5 shows a closer view of two steam hammers and their forges, with a pile of work in the foreground. The hammer at the left is the largest one in use and is rated as a 7000-pound hammer. Nickel steel and carbon steel blocks are used for the dies. The size of these dies can be imagined when I state that the set for this large hammer weighs 5000 pounds; that is, each die block weighs nearly 1½ tons.

The large hammers are fitted with a gallery to give easy access to the valve mechanism and facilitate care and necessary repairs.

Adjoining the drop-forge shop is the annealing room, where all forgings are carefully annealed before they are sent to the machine shop. The annealing furnaces consist of cylindrical boiler-plate shells, lined with firebrick and fired with fuel oil. The forgings to be annealed are put in cast-iron pots such as can be seen in the illustration, and then lowered inside of the annealing furnaces. Here they are heated for several hours then removed and packed in sheet-iron drums where they are allowed to remain several days or until they have thoroughly cooled.

The hoods over these annealing furnaces can be swung upward out of the way in order to facilitate the putting in and taking out of the pots. The room is provided with hoisting devices, and everything is arranged for the expeditious handling of a large volume of work.

GRINDING AND POLISHING

Figs. 6 and 7 show the rough-grinding room and polishing room, respectively. In spite of the imperfections of the half-tone process, it is easy to see that these rooms are free from dust. At the left in Fig. 7 is seen the sheet-iron casing around the large exhauster that conveys the dust from the grinding and polishing machines, to the water-filled chamber out of doors. In the case of the polishing room above the suction is taken through the floor, and the pipes are care-

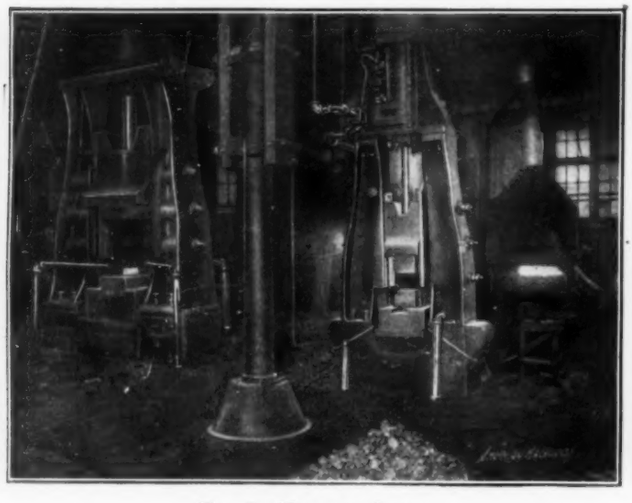

FIG. 5. HAMMER SHOP

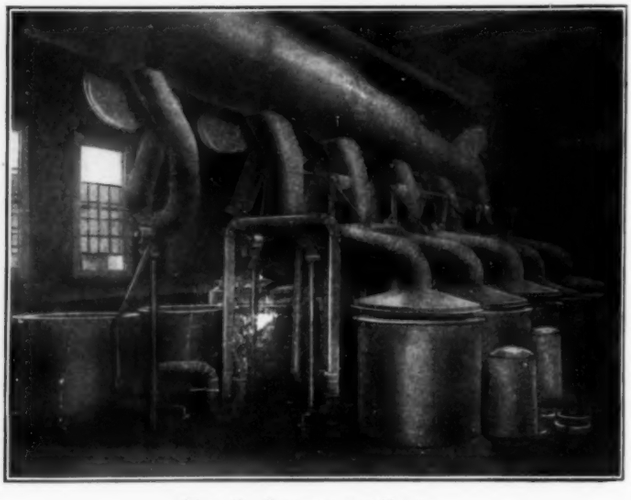

FIG. 6. ANNEALING ROOM

FIG. 7. ROUGH-GRINDING ROOM

FIG. 8. POLISHING ROOM

fully guarded in order to protect them from mechanical injury.

The machine at the right in Fig. 7 is of interest as showing the use of emery-covered cast-iron disks for rough grinding the forgings. All of this grinding, even of the roughest description, is done to a gage, to insure that all of the clearances throughout the tools shall be right.

HANDLE MAKING

Figs 8 and 9 show the handle-making department. Here we see the low-studed ceiling, which is one of the handicaps that has been successfully overcome in adapting the brewery building to a machine shop. Large racks loaded with forgings are in the foreground and in the middle distance. At the left are several large milling machines with chain drives.

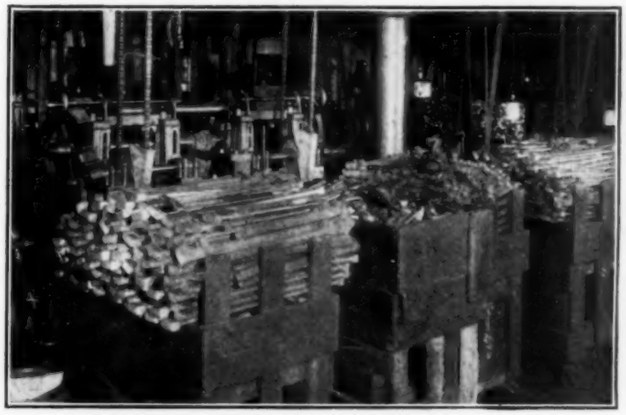

FIG. 9. HANDLE-MAKING ROOM

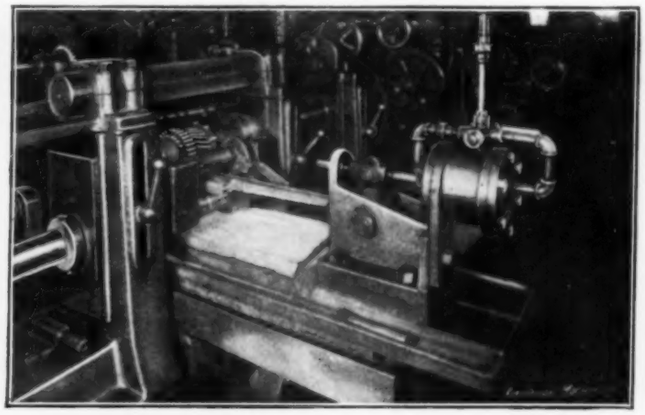

FIG. 10. MILLING A WRENCH HANDLE

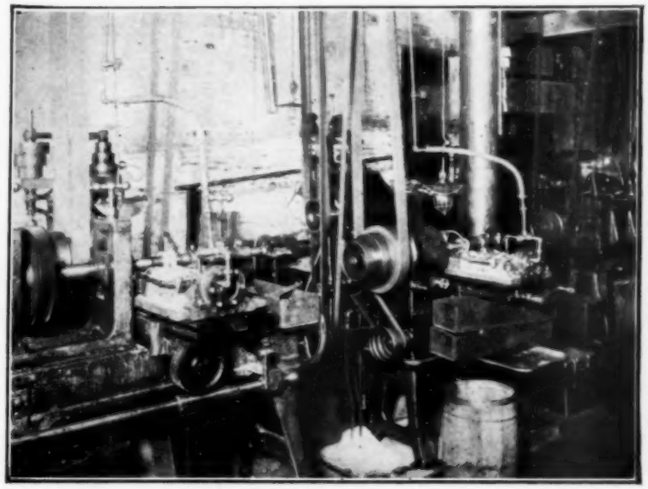

FIG. 11. JAW-MAKING ROOM

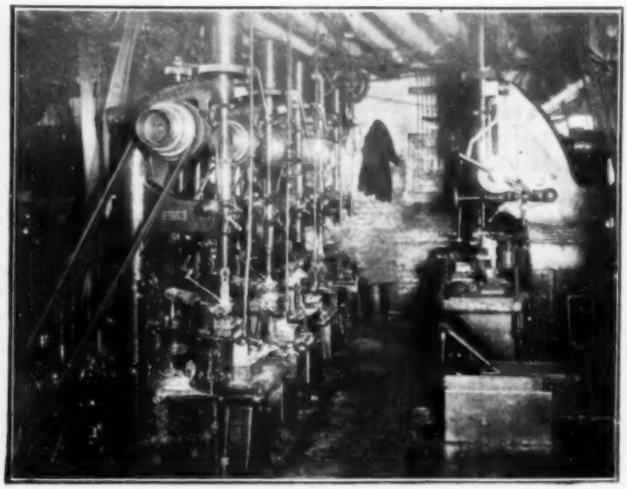

FIG. 12. NUT DRILLING AND TAPPING

In this department, as in many others of the factory, the jigs and fixtures are operated by air pressure. In the basement is an air compressor having a capacity of 210 cubic feet of free air per minute, and compressing to from 80 to 100 pounds. The system of pneumatic tools here used is one of the most extensive that I have ever seen. Fig. 10 shows the air cylinder on a milling machine used for milling the handle of a 14-inch "Trimo" pipe wrench.

The Jaw-making Department

Fig. 11 shows two milling machines in the jaw-making department also using air-operated fixtures, and, again, shows the care which has been used in all of the manufacturing operations throughout the plant.

Similarly, Fig. 12 shows the drilling and tapping department, for making the wrench nuts. These nuts in the larger sizes are drop forgings, and in the smaller sizes are made from bar stock on automatic screw machines. On the drills illustrated, the drilling and tapping are in one operation. The air cylinders for gripping the pieces are seen in front of the columns of the drills. The movement of the piston from the air cylinder is taken through a multiplying lever, in order that the accompanying mechanical advantage may give a secure grip to the nuts during the severe operation of drilling and tapping.

A Wrench-testing Machine

Our final illustration, Fig. 13, shows a large testing machine built to test wrenches. As shown in the figure, a 14-inch pipe wrench is in place, the grip of the wrench being on the squared end of a shaft of the machine, and the end of the handle resting in a shackle connected with the weighing mechanism.

The machine is driven by friction-clutch pulleys at the farther end, motion being transmitted to a shaft running lengthwise and inside of the bed. This shaft in turn is geared by worm gearing to a horizontal shaft connected with a narrow-faced gear on the back. This gear in turn by means of pinions communicates motion to the three horizontal shafts on the top of the machine. The ends of these shafts are used as gripping points for the various kinds of wrenches while these wrenches are under test. It is by the use of this machine that the proportion of the parts in all of the wrenches made by this firm have been worked out, in order that the final wrench shall be well balanced and have ample strength for the severe service that it is to undergo. Needless to say, all of these shafts revolve very slowly. The weighing head has a capacity of 4000 pounds.

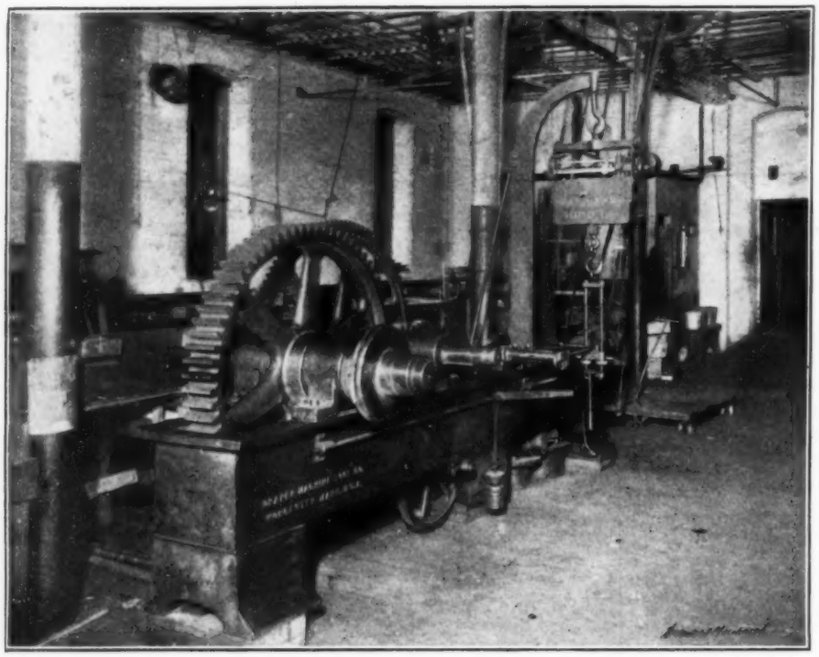

Fig. 13. Wrench-testing Machine

Not every wrench made is tested on this machine as that is obviously unnecessary; but a certain number are tested to make sure that the product is being kept up to the standard set.

Throughout the manufacture inspection is by means of operation. First for the drop forgings, then for the rough grinding, then for the finishing machining operations, then after hardening every piece is rung to be sure that it is sound and contains no fire cracks; finally each assembled wrench is tested to be sure that it operates freely, and every pipe cutter is tested to be sure that the rolls track properly.

We are indebted to the courtesy of the Trimont Manufacturing Company for the excellent photographs used in illustrating this article.

L. P. A.

Necessity versus Leisure

By Entropy

"In order that a man may do his best work he should have an assured livelihood so that no worry may interfere with his concentration of thought on the matter in hand." How often we hear remarks like the above, and also, how often we see men whose best work has been done before they arrived where they had assured incomes. A large part of the best work of the world has been done under the spur of necessity. Despite many often cited cases to the contrary, it is an exceptional man who goes on and really puts the best of himself into business, invention or education after the pressure of necessity is lifted.

All the more credit is due to those who do so. All the more credit to the man who never felt the spur of necessity who yet gets out and hustles.

We have been inclined to give the man most credit who began as a laborer and worked up. We should begin to think something of the man who was born with a silver spoon in his mouth, but who has made successful use of his advantages whether in commercial or professional fields. His was the opportunity for a life of ease and pleasure; he had everything to lose and (shall we say) nothing to win, while the laborer had nothing to lose and everything to gain.

In looking at these two cases we begin to wonder what it is that brings forth the best work in men. Is work a natural or an acquired trade? It is inherited? Is it done for a material reward or is glory or honor the chief incentive? What can be done to increase the efficiency of men, to inspire them to work?

The candid reader must admit that the true answers to all these questions is unknown. In some men there appears a spark of fire and of light that seems to kindle and start them working, and working in right directions and usually without their own knowledge, for it is a fact that many of the best workers do not realize their value until it is told them. This spark, this second birth, may come at almost any age; it may not come at all. If it comes it cannot be resisted. How it comes or why it comes we can only guess.

A new publication entitled, "Mill Supplies" has made its bow in the field of commercial journalism. It is issued by the Crawford Publishing Company, Chicago, Ill., the subscription price being $2 per year.

Backing-off Spiral Fluted Hobs

By Richard T. Wingo *

Backing off hobs with a simple machine so as to have the flutes at any desired angle.

A chart that helps in laying out the problems and how it is made and used.

The use of continued fractions in working out change gears for the milling machine and the backing-off machine.

*Mechanical engineer, the Cadillac Motor Car Company.

The possibility of backing off spiral-fluted hobs in a simple machine that is not provided with differential gears or a "jack in the box," but intended only for hobs with straight flutes parallel with the axis, I trust will be of interest. In some cases it will enable spiral-fluted hobs to be made, with very little additional expense over those with straight flutes.

In reading the article by O. R. Briney on page 883, Volume 33, Part 1, and the one by Walter Groocock on page 589, Volume 33, Part 2, it occurred to me that the calculations might be presented quite completely in a way that would interest young machinists, and especially shop men who do not have sufficient time to study these problems. It is my intention to first show by diagram and explanation how to make the calculations to back off the teeth of any hob having spiral flutes, if the backing-off cam makes a whole number of revolutions.

If the number of revolutions selected for the backing-off cam are a whole numbers, the flutes will probably never be exactly at right angles to the thread, but the error will hardly be noticeable if attention is given to the selection of the number of revolutions of the cam in relation to the number of flutes. That is, having decided on the number of flutes to try, it will be seen by spacing the line BC into equal parts whether the number of revolutions of the cam should be increased or decreased, because the line DE and parallel lines drawn through the points on BC and AC may not be near enough at right angles to BC to give the desired result.

In laying out the diagram to obtain the revolutions of the cam, it will sometimes be found necessary to change both the number of flutes and the number of revolutions of the cam, in order to make the flutes near enough at right angles to the thread so that the cutting angle will not be too obtuse on one edge and too acute on the other.

Using the Diagram

The method of determining the necessary data from a diagram is very readily understood. In making these calculations it is intended that the backing-off tool travel in a line parallel with the axis of the hob, and it is not necessary to use a taper attachment to make any correction. The only change gears required are the ones to give the proper lead of the thread and the number of revolutions of the backing-off cam.

In looking at the diagram it will be seen that the line AB represents the lead of a twelve-threaded hob, the line AC the pitch circumference, the line BC the number of revolutions of the backing-off cam and the angle E the angle of the flutes with the axis of the hob. The line AC is divided into seven equal parts and the line BC into ten equal parts.

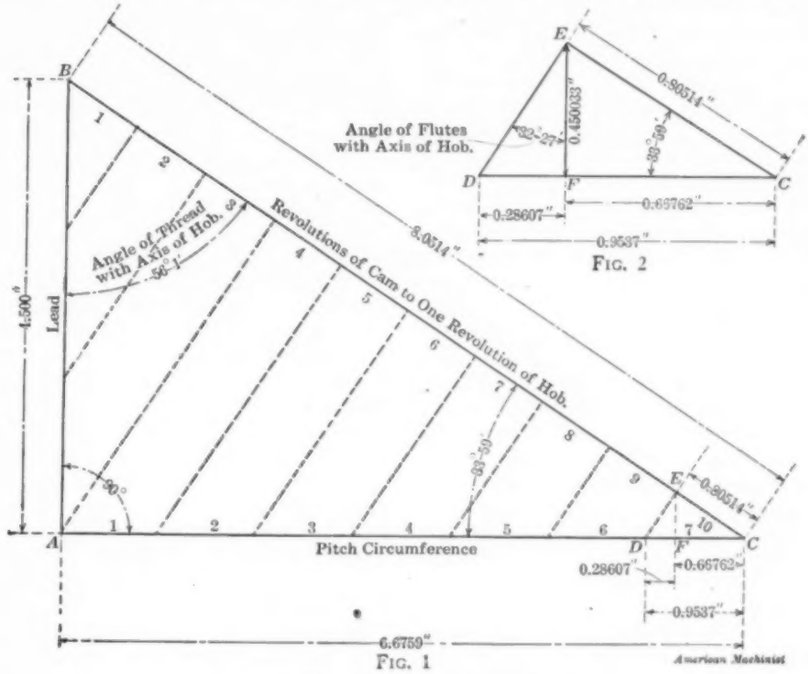

FIG. 1

FIG. 2

BACKING OFF SPIRAL-FLUTED HOBS

The diagram Fig. 1, shows that if a hob of 4.500 inches lead, 2.125 inches pitch diameter, has seven spiral flutes, the backing-off cam should make ten revolutions to one of the hob. After determining the number of flutes and the revolutions of the backing-off cam, it is necessary to know the angle of the spiral flutes with the axis of the hob and also the lead of the flutes.

The Small Triangle

The diagram Fig. 1, shows a small triangle DCE, and it is from this triangle that we make the calculations to find the lead and angle of the spiral flutes with the axis of the hob. From the diagram, the distance DC is one-seventh of AC, and CE is one-tenth of BC. As the angle B is 56 degrees 1 minute, which is the angle of the thread of hob with the axis, the angle C will be 33 degrees 59 minutes because the angle A is 90 degrees. We now have the angle C and the distance CE, from which to find the length of EF, CF, DF and the angle E, of the triangle DEF.

To find the side EF, multiply the sine of 33 degrees 59 minutes by the distance CE. The side CF is found by multiplying the cosine of 33 degrees 59 minutes by the distance CE. To find the distance DF, subtract CF from CD. To find the tangent of the angle E, of the triangle DEF, divide the length of DF, by EF.

The lead of the flutes is now obtained by dividing the pitch circumference of the hob by the tangent of the angle E, which we find is 32 degrees 27 minutes. For convenience in figuring, the small triangle DCE is shown enlarged in Fig. 2.

Two Examples

Two exampes worked out in detail will assist in the understanding of this problem. The first example is for a hob with

flutes at any angle. The second example is for a hob with flutes at right angles to the thread.

Flutes at Any Angle

According to the first example the calculations for the hob will be:

Number of threads	12
Lead of threads	4.500″
Pitch diameter of hob	2.125″
Angle of thread with axis of hob	56° 1′
Number of spiral flutes	7
Lead of spiral flutes	10.500″
Angle of spiral flutes with axis of hob	32° 27′
Number of revolutions of backing-off cam to one of hob	10
Ratio of work spindle of backing-off machine to cam shaft	12
Lead of lead screw in backing-off machine	1.250″
Change gears to mill spiral flutes in milling machine	$\frac{56 \times 48 \text{ followers}}{40 \times 64 \text{ drivers}}$
Change gears to cut hob thread in backing-off machine	$\frac{96 \times 72 \text{ drivers}}{40 \times 48 \text{ followers}}$
Change gears to connect work spindle and cam shaft	$\frac{60 \times 80 \text{ drivers}}{90 \times 64 \text{ followers}}$

Having the lead and pitch diameter of the hob thread given, first find the pitch circumference; then draw the line *A B*, equal in length to the lead of the thread. Draw the line *A C* at right angles to *A B*, equal to the pitch circumference. Then draw the line *B C*, completing the right-angled triangle.

We can now determine the number of flutes, revolutions of backing-off cam, angle and lead of the flutes. As we have selected seven flutes the line *A C*, must be divided into seven equal parts. As we have learned, that it is desirable to have the flutes at right angles to the thread we must find by trial spacing where a line drawn through *D* will come when it is as near 90 degrees to the line *B C*, as it is possible to get it. Bear in mind that the line *B C* must be divided into an equal number of parts, in this case, ten. We should now find the length of *B C*, and then proceed to make the necessary calculations from the given data as follows:

Working Out the Problems

Pitch circumference of hob = 3.1416 multiplied by the pitch diameter or 3.1416 × 2.125 = 6.6759000 = pitch circumference of hob.

$$\textit{Tan. of angle of thread with axis} = \frac{\textit{Pitch circumference}}{\textit{Lead}} = \frac{6.67590}{4.5} = 1.4835 = \textit{tan. } 56^\circ\ 1'.$$

$$\textit{Hypothenuse of angle Fig. 1} = \sqrt{(\textit{lead})^2 + (\textit{pitch circumference})^2}.$$

$$\textit{Lead}^2 = 4.5 \times 4.5 = 20.25.$$

$$\textit{Pitch circumference}^2 = 44.57664081$$

$$\textit{Lead}^2 + \textit{pitch circumference}^2 = 64.82664081.$$

Square root of this = 8.0514 = *hypotenuse of triangle, Fig.* 1.

We now have the pitch circumference, the angle *B*, or the angle of thread with the axis of hob, and as the angle *A* is 90 degrees, we find that the angle *C* is 33 degrees 59 minutes. As we have calculated the length of line *B C*, we now know the distance *C E*, because it is one-tenth of *B C*. Having the angle *C*, and the distance *C E*, the opposite side *E F*, the adjacent side *C F*, the distance *D F*, and the angle *E*, are found as follows:

Opposite side *E F* = *sin.* 33 degrees 59 minutes, multiplied by the distance *C E*. *Sin.* 33 degrees 59 minutes = 0.55895 × 0.80514 = 0.4500 = side *E F* of triangle *E C F*. Adjacent side *C F* = *cos.* 33 degrees 59 minutes multiplied by the distance *C E*. *Cos.* 33 degrees 59 minutes = 0.8292 × 0.80514 = 0.66762 = side *C F*, of the triangle *E C F*. The distance *D F* = *C D* − *C F*. *C D* = 1/7 of 6.6759 = 0.9537. 0.95370 − 0.66762 = 0.28607.

$$\textit{Tan. of angle } E = \frac{DF}{EF} = \frac{0.2860}{0.4500} = 0.6356 = \textit{tan. of angle } E = 32^\circ - 27'.$$

$$\textit{Lead of flutes} = \frac{\textit{Pitch circumference}}{\textit{Tan. of } 32^\circ - 27'} = \frac{6.6759}{0.6358} = 10.500.$$

It can now be seen that the angle of the flutes with the thread can be varied or changed by allowing the backing-off cam to make fewer or more revolutions than we have shown. But if the flutes must be at right angles to the hob thread, then the revolutions of the cam in relation to the number of flutes will be in whole numbers and a fraction, and the cam shaft must be geared accordingly. This will be shown by the second example.

Flutes at Right Angles to Thread

In this we select the same hob as before and make the calculations for the revolutions of the backing-off cam, so that the flutes will be at right angles to the thread. It should be understood that if the revolutions of the cam are changed the angle and the lead of the flutes must be changed to suit otherwise the hob will not be backed off properly. And in order to have the hob the same diameter at each end, the backing-off tool should begin its backing-off cut exactly the same on each tooth.

After having decided the number of flutes for a given pitch diameter and lead, the next step is to find the revolutions of the backing-off cam, which will be as below.

$$\textit{Number of revolutions of cam} = \frac{\textit{Number of flutes}}{\textit{Sin.}^2 \textit{ of angle of hob thread with axis}}.$$

Sin. 56 *degrees* − 1 *minute* = 0.8292.

Squaring this gives 0.68757; $\frac{7}{0.68757}$ = 10.18074 = revolutions of the backing-off cam.

We have now found that the backing-off cam makes 10 whole revolutions and a fraction, to one revolution of the hob, therefore the lead and angle of the flutes must be calculated to correspond.

$$\textit{Lead of flutes} = \frac{\textit{Number of flutes} \times \textit{lead of hob thread}}{\textit{Revolutions of cam} - \textit{number of flutes}}$$

$$\frac{7 \times 4.5}{10.18074 - 7} = \frac{31.5}{3.18074} = 9.9033$$

equals lead of flutes when at right angles to the thread.

$$\textit{Tan. of angle of flutes with axis of hob} = \frac{\textit{Pitch circumference}}{\textit{Lead of flutes}} \quad \frac{6.6759}{9.9033} = 0.67410$$

equals *tan.* of angle of flutes with axis of hob equals 30 degrees 59 minutes.

Where Continued Fractions Come In Handy

As our calculations show the number of revolutions of the backing-off cam and the lead of the flutes, we can now show how to gear the cam shaft to give the revolutions, and the milling machine for milling the flutes. It will be seen that both the revolutions of the cam and the lead of the flutes contain such large fractions that they would be awkward in their present form, but by continued fractions they can be expressed in smaller numbers sufficiently near in value to the original number or fraction. According to our calculations the revolutions of the backing-off cam are 10.1807, but by continued fractions we find that 10 15/83 is practically the same as the original number. This is the ratio that we must gear the work spindle of the backing-off machine and also the cam shaft. The method of continued fractions will show how the new number for the revolutions of the backing-off cam is obtained.

$$10.1807 = 10\tfrac{15}{83} \textit{ rev. of backing-off cam.}$$

$$\frac{1807}{10000}$$

1807) 10000 (5
9035
965) 1807 (1
965
842) 965 (1
842
123) 842 (6
738
104) 123 (1
104
19) 104 (5
95
9) 19 (2
18
1) 9 (9
9

+	−	+	−	+	−	+	0
5	1	1	6	1	5	2	9
1	1	2	13	15	88	191	1807
5	6	11	72	83	487	1057	10000

$\frac{15}{83} = 0.18072$, which is very close and is easier to handle than the larger fractions.

The Backing-off Machine

As previously stated, the ratio of the work spindle of the backing-off machine to the cam shaft is 12, the ratio of the change gears can be found as below.

Revolutions of backing-off cam = $10.1807 = 10\frac{15}{83}$; therefore, $10\frac{15}{83} = \frac{845}{83}$. Then:

$$\frac{\frac{845}{83}}{\frac{12}{1}} = \frac{845 \times 1}{83 \times 12} = \frac{845}{996} = \frac{65 \times 13}{85 \times 12} =$$

$$\frac{65 \times 52 \textit{ drivers}}{83 \times 48 \textit{ followers}}.$$

In the same manner by continued fractions we can find another number for the lead of flutes expressed in smaller terms. The lead of flutes, according to our calculation, is 9.9033 inches, then by continued fractions as before, we have:

$$\textit{Lead of flutes} = 9.9033 = 9\tfrac{47}{52}.$$

After making the reduction by continued fractions we select one of the numbers or partial quotients, but find that upon further calculation in finding the change gears the number is prime and cannot be factored, then we must find a number that can be factored that is of the same ratio required. We find that 9 28/31 = 307/31, is prime and cannot be factored, therefore we can add 19/21 to 28/31 and obtain 47/52, which will be accurate enough, and we now have for our new number 9 47/52, which equals 515/52. The common ratio for milling machines is 10, then to find the correct change gears the expression becomes:

$$9\frac{47}{52} = \frac{515}{52}.$$

$$\frac{\frac{515}{52}}{\frac{10}{1}} = \frac{515 \times 1}{52 \times 10} = \frac{515}{520} = \frac{5 \times 103}{8 \times 65} =$$

$$\frac{60 \times 103 \textit{ followers}}{96 \times 65 \textit{ drivers}}.$$

The Two Examples

By comparing the two examples for the same hob, it will be observed that the revolutions of the backing-off cam, lead and angle of flutes are different, because in the first example, the revolutions of the cam are whole numbers and the flutes are only approximately at right angles to the thread; but in the second example, the revolutions of the cam are whole numbers and a fraction, as the flutes are at right angles to the thread.

By following the rules given in this article, any hob requiring spiral flutes can be calculated.

When Flutes Are at Right Angles

Number of threads	12
Lead of threads	4.500″
Pitch diameter of hob	2.125″
Angle of thread with axis of hob	56° 1′
Number of spiral flutes	7
Lead of spiral flutes	9.9033
Angle of spiral flutes with axis of hob	33° 59′
Number of revolutions of backing-off cam to one of hob	10.1807
Ratio of work spindle of backing-off machine to cam shaft	12
Lead of lead screw in backing-off machine	1.250″
Change gears to mill spiral flutes in milling machine	$\frac{60 \times 103 \text{ followers}}{96 \times 65 \text{ drivers}}$
Change gears to cut thread in backing-off machine	$\frac{96 \times 72 \text{ drivers}}{40 \times 48 \text{ followers}}$
Change gears to connect work spindle and cam shaft	$\frac{65 \times 52 \text{ drivers}}{83 \times 48 \text{ followers}}$

Grinding Pointers

If the spindle on which the wheel is to go is just a little smaller than the hole of the wheel, the wheel will be out of balance unless it is exactly centered, which is a very difficult thing to do or have done in the average shop.

The color of a grinding wheel does not affect the cutting quality or the life. The cause of the differences in color in grinding wheels is the difference in color of the bond used in the mixture. Kiln conditions also affect the color to some extent.

The use of compound in grinding improves the cutting and prolongs the life of the wheel.

It is not always necessary that grinding wheels should be trued with sharp diamonds. Sometimes unsuccessful efforts to obtain a good finish are due to the fact that the grinding wheel was trued with a sharp diamond. When truing, a square holder should not be used. A round holder enables the operator to present a new face of the diamond at any time.

To get true grinding economy, we must have coöperation between the turning and grinding departments. Where modern manufacturing methods are in vogue, marked economy is shown in the turning department made possible by the use of modern grinding machines. Many times the grinding machine is not given due credit for the saving in turning made possible only by the grinding methods.

It is known that scratches are caused many times by some of the material ground off the piece adhering to the wheel, whether or not the wheel is coarse or fine.

When there is no room for the chips, the grinding wheel loads, if the wheel is strong enough so that the cutting grains do not break out.

Complaints of wheels developing soft spots are usually due to a soft wheel and are very easily overcome by substituting a harder wheel.

In most cases of complaints on wheels being out of true, this has been caused by the wheel having been forced on the arbor on the spindle with uneven side pressure. The hole is put out of line enough to cause the wheel to run out sideways even after tightening the nut. This is very easy to remedy, simply loosen and tighten the nut a few times with a turning of the wheel, thereby forcing the hole in line again. The cause of this may be due to the spindle being oversize.

As a rule the greatest economy is obtained by the combination of grinding with very rough turning. Yet there are cases where the least expensive way is to grind direct without turning.

You can appreciate, therefore, the importance of using wheels made of modern "grit" or cutting material. Grinding wheels made of different grit will give different results just as tools made of different steels will give different results.

By merely changing the speed of either the wheel or work, failure is sometimes turned into success. Even a slight variation in speed may make this difference.

If grinding-wheel users would stop and consider that each particle or grain of abrasive is called upon to do more work as the grinding wheel is reduced in diameter, he would not declare that the wheel is softer near the center because it wears faster.

Then, again, if he would see that the correct surface rate of speed is maintained as the wheel is reduced in diameter, the difference in wear would not be so noticeable.

A great variety of combinations of grain and grade is required in surface grinding. Variation in sizes and shapes of pieces to be ground makes it necessary to vary the combinations of grain and grade of grinding wheels in order to get the best results.—*Grits and Grinds.*

Compulsory Licenses of Patents in Germany

The present German law empowers the authorities, within their discretion, to revoke a patent if, during the first three years the inventor neglects to work it adequately in the country or to take proper steps to that end, and refuses to license its use upon reasonable compensation and security, if such license appears to be required by public welfare. The application of this law was explained by George Neumann in the AMERICAN MACHINIST, Volume 33, Part 1, page 679.

The German government now proposes to make a regulation by which the authorities may, instead of revoking the patent, compel a license of the same.

It is probably known to most of our readers interested in the matter that a reciprocity treaty exists between this country and Germany considerably mitigating the compulsory working requirement.

Iron pipes lined with lead are made for the transmission of acids which would quickly destroy unprotected iron. These pipes are made up to large sizes; one copper smelting company, for instance, has 30,000 ft. of 10-in. pipe lined with lead which has been in use 12 years.

| NO OF PIECES | | MINUTES → | | |

Jig Clamps and Clamping Methods

By Lucian Haas *

Different methods of holding work, showing the construction of various kinds of clamps and giving their advantages for certain kinds of work.

Rapidity of handling and security in holding work are the main features to be considered as they bear directly on the quantity and quality of the output.

The proper designing or making of clamps or clamping devices is one of the most important points in tool designing, and it too frequently happens that quantities of work are spoiled and needless injury often befalls the operator through their faulty construction.

There are but four things to be considered in the designing of a clamp: strength, the correct point for applying power on the clamp, the bearing points of the clamp, and the means provided to prevent clamp from turning when tightening down the nut or bolt.

Figs. 1 and 2 are three points bearing clamps, two bearing points in front and one in the rear. Attention may be called to these bearing points being rounded, which allows the clamp to properly seat itself on the work and to compensate for any variation in the size of the part to be clamped. This is particularly useful when a rough casting is to be operated on.

It is well to provide a spring underneath the clamps, as shown in Fig. 2, this will reduce the time otherwise required to manipulate clamps of this description.

Figs. 3, 4 and 5 are similar to Figs. 1 and 2, except the two points of bearing are in the rear and the single point in the front. Fig. 3 is the style of clamp frequently used for holding drill jigs, milling fixtures, lathes, fixtures, etc., to the table, bed or face plate of the machine.

Figs. 6 and 12 are also similar and are generally used in box-jig construction. They can be easily removed by sliding the plate longitudinally. The clamping screw is carried in a plate which is held in place by the retaining grooves.

Figs. 7 and 8 are good examples of what are generally called hook bolts; the bearing point of the hook should always be as close to the bolt as is possible.

Fig. 9 is a design of clamp not frequently seen in use, although for light clamping it has many advantages, it is quick to operate and takes up but very little room, which is so important in tool designing and making.

Fig. 10 is the style of clamps most frequently used in drill-jig construction, especially table or box jigs. With this design the piece is held in the jig by one point striking in the center. In Fig. 11 the same style of clamp is used, except that it has two self-adjusting bearing points and in some instances three points.

Figs. 13 to 18, inclusive, show a few designs for jig straps. Figs. 13 to 18 are the most commonly used; Fig. 13 is what may be called the swinging type; the others are all removable. The material generally used for making straps of this description is a good grade of machine steel.

Figs. 19 to 24, inclusive, illustrate the

*Chief tool designer, Thomas Motor Company, Buffalo, N. Y.

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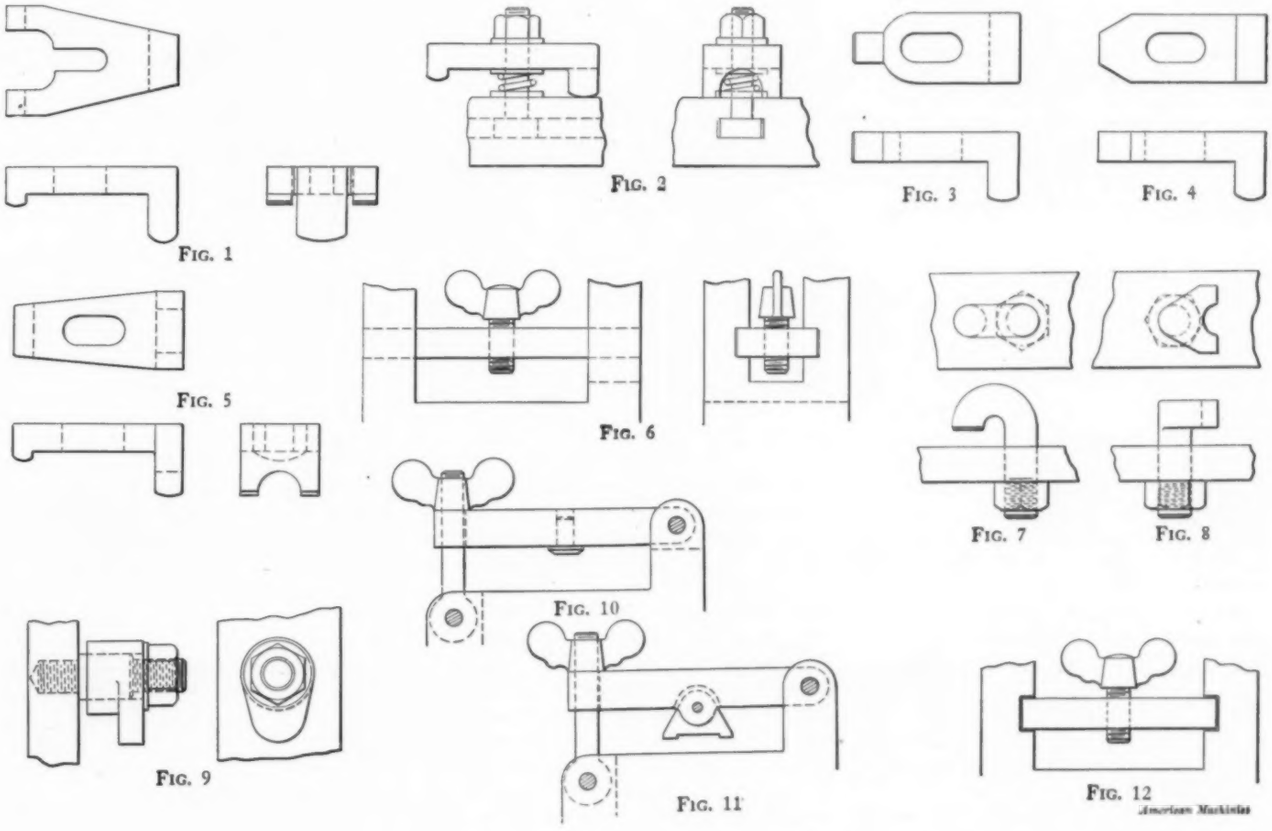


A VARIETY OF STRAPS, SWING LIDS AND HOOK BOLTS

principal methods of holding clamps from turning while the nut or bolt is being tightened on them. The tool designer or maker too often overlooks this important point and does not seem to realize the advantage of properly holding them.

Figs. 19, 20 and 21 are styles commonly used in drill-jig construction, while Figs. 22, 23 and 24 are most frequently found in use on milling fixtures. The object of securing clamps in this manner is to get more rapid production from the tool to which they are assigned, and if only a second can be saved in the process of tightening down the clamp on the work, that second means many hours, if a great quantity of work is to be done.

Figs. 25 and 26 show two designs of latches, such as are used on small jigs for holding down a lid or plate which contains bushings or binding screws. Latches are made in many different styles. Sometimes the hook screw or lock screw is styled as a latch, probably because it is used for the same purpose. Examples of these screws are shown in Figs. 27 and 28. It is unnecessary to describe them further, as the illustrations speak for themselves.

Fig. 29 shows the design of an eccentric pin which is removable, but by threading the end and using a nut and washer it can be held in place, thus making it stationary, as indicated by dotted lines. The eccentric of *E* varies from 1/16 to ¼ inch, depending entirely upon the size of the pin. The diameters *A* and *B* are made a sliding or working fit in the bushings *C*. These bushings are generally made of cold drawn steel and case hardened.

Fig. 30 is another design of eccentric pin working in the body of the jig, and the illustration shows it operating two bolts *B B*. These bolts are in turn attached to a strap *A*. The pin, it will be noticed, is eccentric on both ends.

When the lever *C* is forced down the screw *E* will bear against the work and in case of any variation in the size of the work, such as a rough casting, this screw can be adjusted to suit.

The washer *D* should be rounded on the side bearing against the strap, which will allow an equal clamping stress on each of the bolts.

Figs. 31 and 32 show two designs of swinging binders, which are both used considerably in drill-jig construction. Fig. 31 is the most popular for the reason that it can be made very small and by a good proportion its strength maintained. It has the advantage over Fig. 32 of having two screws instead of one to take up the thrust of the binding screw.

Figs. 33 to 36 show the construction of the sliding bushings which are so often used for holding the work as well as piloting the drill. The clamp is used in all cases for forcing the bushing against the work. Attention may be first called to Fig. 33 in this design, the bearing points *R* and *A*, are rounded to compensate for any variation in the hight of the work and always allow the clamp to properly seat itself preparatory to the thrust of the binding bolt or nut.

A spring *C* is placed directly beneath the clamp so that it will automatically bring the clamp back to its original position when the nut is released. If the slot in the clamp through which the bolt

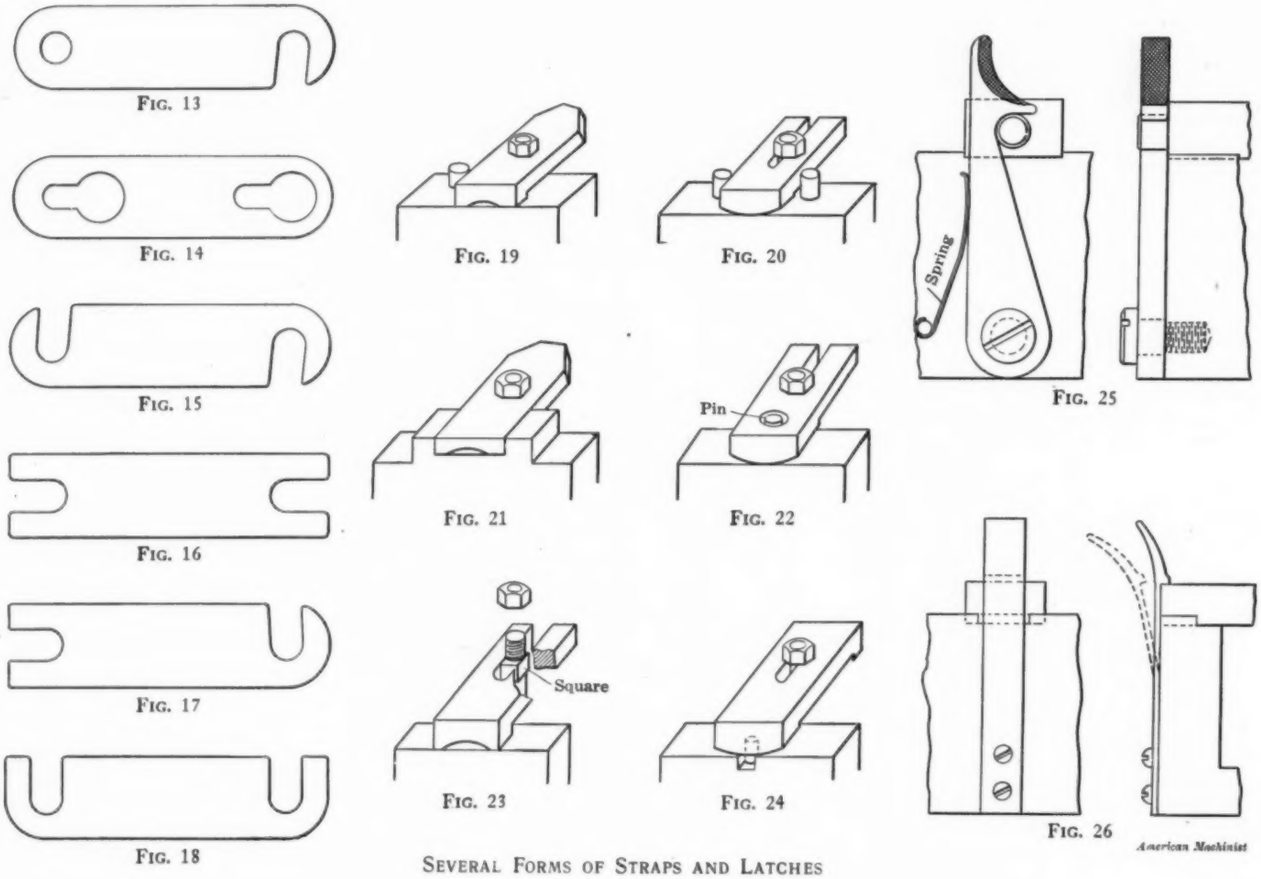


FIG. 13 FIG. 14 FIG. 15 FIG. 16 FIG. 17 FIG. 18 FIG. 19 FIG. 20 FIG. 21 FIG. 22 FIG. 23 FIG. 24 FIG. 25 FIG. 26

SEVERAL FORMS OF STRAPS AND LATCHES

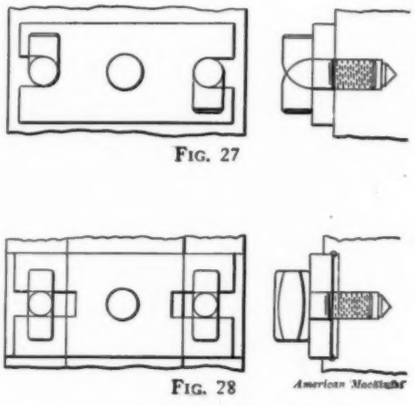


FIG. 27 FIG. 28

T-HEAD BOLTS

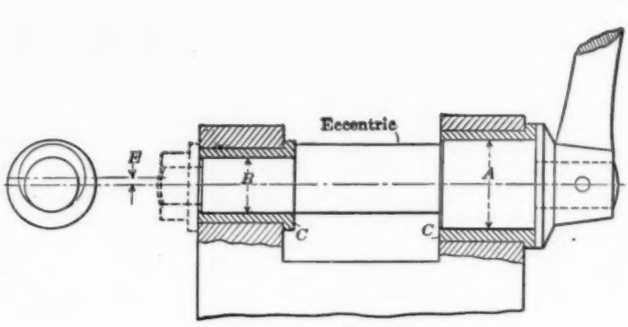


FIG. 29

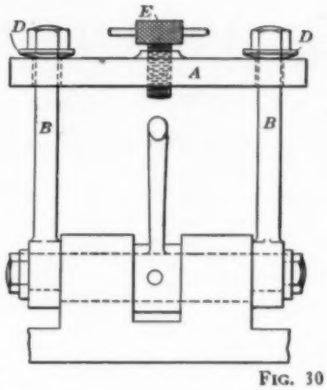
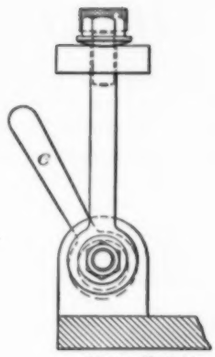


FIG. 30



ECCENTRIC HOLDING DOWN DEVICES

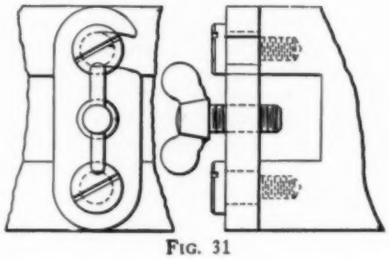


FIG. 31

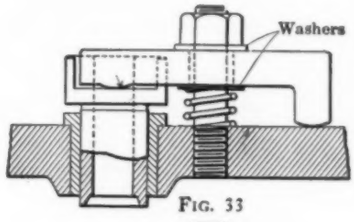
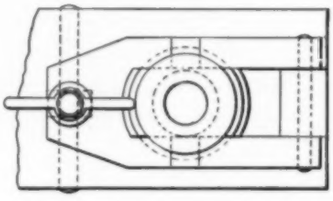


FIG. 33



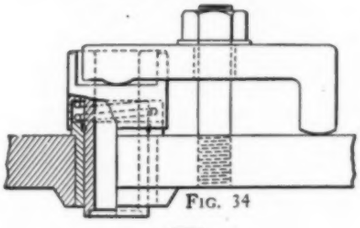


FIG. 34

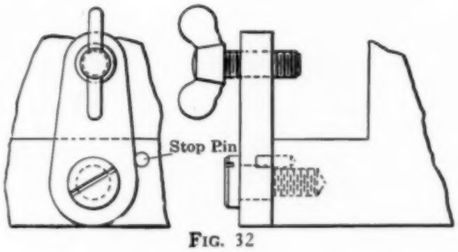


FIG. 32

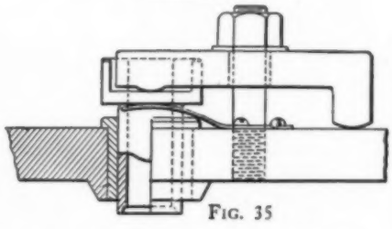


FIG. 35

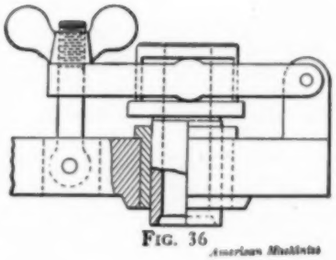


FIG. 36

STOP PINS AND SPRING-LIFTED STRAPS

enters is elongated, it is advisable to place washers beneath the nut and between the clamp and spring as shown.

Figs. 34, 35 and 36 are of similar design. The spring in this case, instead of being placed under the clamp, is directly beneath the head of the clamping bushing in Fig. 34; this spring is a coiled spring and is protected from dirt and chips by a specially designed head on the bushing. In Fig. 35 a flat spring is shown, in this case it is not necessary to protect the spring from dirt or chips, etc. In either case these two designs have the advantage, as the spring raises the bushing as well as the clamp as soon as the binding nut is released, while in Fig. 33 the clamp is only released, and it becomes necessary for the operator to lift the bushing when removing or placing the part to be drilled.

Fig. 36 shows another way of operating these bushings. It is somewhat objectionable, owing to the fact that it is expensive and it has no advantages over the preceding designs.

Two Fires That Might Have Been Prevented

BY IRVINE KEMPT

Within the past few months two cases of fire, which might have resulted seriously but for their timely discovery, have come under our notice.

The first was in a country shop, whose exhaust pipe from the buffing wheels was merely carried through the side of the building, depositing its lint and dust upon the ground. This had been going on for three years and quite an accumulation of inflammable material had resulted. On a very hot day of last summer, about two p.m., the mass broke into a lively blaze. Fortunately it was observed before much headway was made and speedily extinguished.

The other occurred in a coal pocket, which had been located next to the boiler, one side of the pocket being the wall setting of the boiler. Some glimmering of danger had been borne in upon the fireman, who had placed some of the crating, which comes around the sheet tin, between the boiler setting and the coal.

This may have been of some value in delaying ignition; but some days after, about nine a.m., the fireman reported smoke issuing from the coal pocket. Investigation showed a fire had started in the pocket, but prompt measure prevented serious damage. Had it occurred 12 hours later, the consequences might have been serious.

These cases show that underwriters' inspectors still have a few more points to learn; also that a sketch of the coal storage should be submitted for approval by competent officials.

Molding a Forging Machine Frame

By Jabez Nall

An 84,000-pound casting made by the "bedding in" process.

The drag put in a permanent concrete casting pit and the sand packed around the pattern which remains entirely in the drag.

Use of cores to avoid loose pieces on the pattern.

Pattern lagging parallel with the draw to facilitate removal from the sand.

Construction of the mold for casting the frame of a 7-inch Ajax forging machine is shown by the accompanying halftones, this being the biggest machine of its kind up to date. The rough weight of this casting, shown in Fig. 1, was 84,400 pounds and it was made by the United Engineering and Foundry Company, Vandergrift, Penn.

In the making of this, or any other large and complicated casting, it is necessary that the plan of operations be well considered, from the making of the pattern to the pouring of the metal and the handling of the casting. The risk is so great and the chances for accident so many, that every precaution must be taken to safeguard the job and bring it to a successful finish.

Pattern Construction

In this case the pattern was constructed with the idea in mind of providing the molder with the simplest and most effective tool with which to do the work, and produce the shape required with the least expenditure of time and labor. Wherever an anchor, or "drawback," would otherwise be necessary, core prints and core boxes were provided, the lines of the pattern being kept as plain and simple as possible. All core prints were given a good taper with the line of draft, thus permitting the easy placing of the core in the imprint with the assurance of a fairly close fit when placed.

The number of loose parts was kept to a minimum, consistent with easy handling in drawing the parts from the mold. The deep ribs at the right front of Fig. 1 were made in a core (see also section drawing, Fig. 2, at *A*) this being done to give a better chance to secure the sand in this part of the mold and to dry it more perfectly.

As far as was consistent with making the pattern strong and of a long life, the outside boarding was secured with the grain of the wood vertical, or with the lines of draft. This helps considerably in the drawing of the pattern, and anything that will tend toward making this operation easy and insure a "good draw" is appreciated by the molder. Anyone not familiar with foundry practice would be surprised to see the amount of power required to draw so large a pattern from the sand after it has been buried for a week or more, and to realize the consequent strain on the lifting straps. This is an important point in pattern making not always fully realized, or properly considered by the patternmaker; otherwise, some lifting straps would be stronger and some others would be better secured, thus sparing the molder considerable trouble.

The Casting Pit

The mold was made in a permanent casting pit having concrete walls and centrally located between and in front of the two furnaces that were to produce the metal. The ladle pit for the large furnace is shown partly at the rear of Figs. 3 and 4, the principal runner and gates being at this end of the mold. The furnace spout and ladle pit for the smaller furnace are shown at the rear of the mold in Fig. 5, between it and the roll-casting pit beyond.

About 135,000 pounds of metal were required for the heat, 82,000 being charged in the large furnace and 53,000 in the smaller. In handling this metal in the ladles, all that was necessary was to raise them and turn the stopper to the correct position to pour; they were then practically in place without requiring any travel. The convenience of this readily will be seen and, with the ladles charged to the limit, its importance understood.

In commencing the mold, the first essential after deciding on the place wherein to make it, was a flask or molding box large enough to contain the job. As is common to most foundries, the flask used was of the built-up or sectional type, which can be added to or reduced according to the requirements of the pattern to be molded. This may be seen in Figs. 6 and 7, which show the arrangement in part. It being undesirable to roll or turn over so large a flask, for several reasons, particularly those of the space required and the risk in handling, and because the type of pattern made it possible as readily to "bed it in," this was the method adopted.

Bedding In the Pattern

As the lower or drag half of the mold would not have to be disturbed, it was

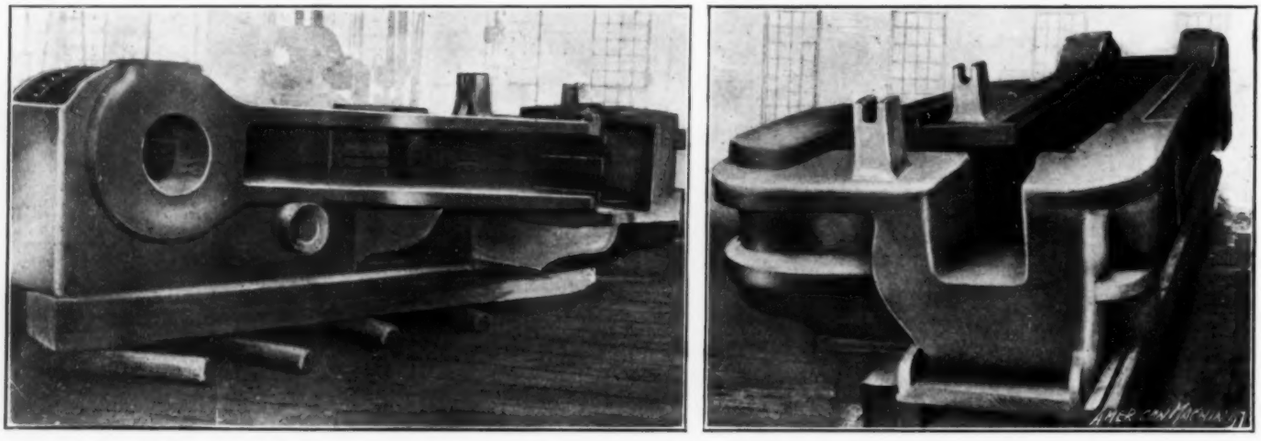


Fig. 1. Two Views of the Casting as It Leaves the Foundry

necessary that this part of the flask be set with the top edge level with the floor line, the underside being braced and made solid by ramming sand to the required hight. The flask thus set, the molder was ready to form the "bed" for the pattern; an idea of this may be obtained from the section drawing, Fig. 2. A layer of sand was laid first, and on this a bed of cinders to form a free passage for the gases generated by the heat and displacement of the metal, to which cinder bed the greater part of the mold and the bottom layer of cores were vented. In the section drawing the general direction of the vents is indicated by the arrows.

Upon the cinder bed a strong ramming of heap sand was made, high enough to bring the top of pattern about an inch below the joint line of flask. The pattern then was placed temporarily in position in the flask and the location of such level surfaces as would form as ample a seat for the pattern as possible were marked; the pattern was removed and at these places a layer of a specially prepared facing sand about one inch or more thick was rammed up and made level. The pattern again was placed and the rest of the impression of the underside formed by ramming or tucking underneath. This is no "cinch" for the molder, as it is work that must be done in an uncomfortable position, and is, therefore, both difficult and disagreeable.

The pattern next was staked or blocked in such manner that it could be returned correctly to the same position, and again was lifted away, the loose parts on the underside (in this case the lug for tie rod and prints for oil-pocket cores) remaining down. The impression then was corrected, soft spots produced by inaccessibility or other cause rectified, and the pattern finally returned to position. Next the impression was brought out still further by rapping down the pattern with a heavy sledge pounding on a block of wood, an operation which seems to afford some amusement for the molder, but makes the patternmaker wonder if the job will stand it, especially as the molder seeks out the least solid parts of the pattern so as to produce the most noise and do the least good. This completed the operation of bedding in the pattern.

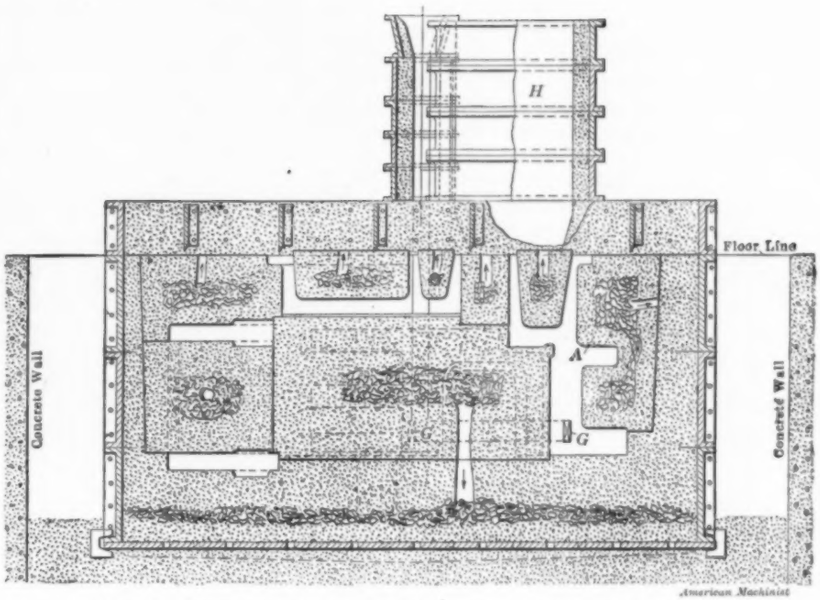


FIG. 2. CROSS-SECTION OF MOLD, SHOWING CORES AND VENTS

GATES AND RUNNERS

The gates and runners were built in at each end of the mold, the arrangement being similar for both. This is shown at *G*, Fig. 2. There were two of these openings at each end, fed from one upright, and a safety or flush gate led from this, as seen in Fig. 5. The upright runner was about 4¼ inches in diameter and the openings or gates 2¼ x 4½ inches. The mold being rammed up to the top of the drag flask and pattern, the cope section was set on. The pattern then was laid out to show the lines of metal, so that it was a simple matter to determine on the location of the necessary vents and feeding heads. There were three of the latter for this mold; one on each side of the casting, directly

Loose parts of the pattern were put in place next, secured by loose dowel pins, which must be removed as the ramming progresses. The walls of the mold were reinforced by rods laid in, especial care being taken to secure all weak corners and overhanging sand; the walls were faced up with a strong facing, backed up with ordinary heap sand.

FIG. 3. MOLD WITHOUT CORES. SHOWING VENTING FOR BOTTOM CORES

FIG. 4. LOWERING CORES INTO PLACE

above the center of the crank-shaft bearings (these were 14 inches in diameter and about 30 inches high), and one large head at the front of the casting, as seen in Figs. 2, 5 and 6. This latter head was 30 inches in diameter and about 60 inches high and is shown at *H*, Fig. 2.

In order to fill up the large head when pouring the casting, it was necessary, of course, to chill or freeze the top of the smaller heads. This was done by the sudden cooling of the top, a plate being set over the top and weighted down. This is somewhat of a digression, as it gets us ahead of our story.

With the cope filled in, the sand being well supported by the flask bars and numerous chucks or cross pieces between the bars and further reinforced by gaggers or hooked rods, it was lifted off and set aside on proper supports for finishing. The body of the pattern next was withdrawn, the loose parts afterward being drawn into the space left by the removal of the pattern body. The surface was gone over carefully and any soft spots from defective ramming made solid, any patching or venting required being done as the work progressed. To prevent scabbing or buckling the surface, it was well supported by nails, particularly at the corners, these nails being specially made for this purpose, 4 or 5 inches long, of a light grade of wire and with an extra large head. How closely these were placed and an idea of how many were required may be noted in Figs. 3 and 4.

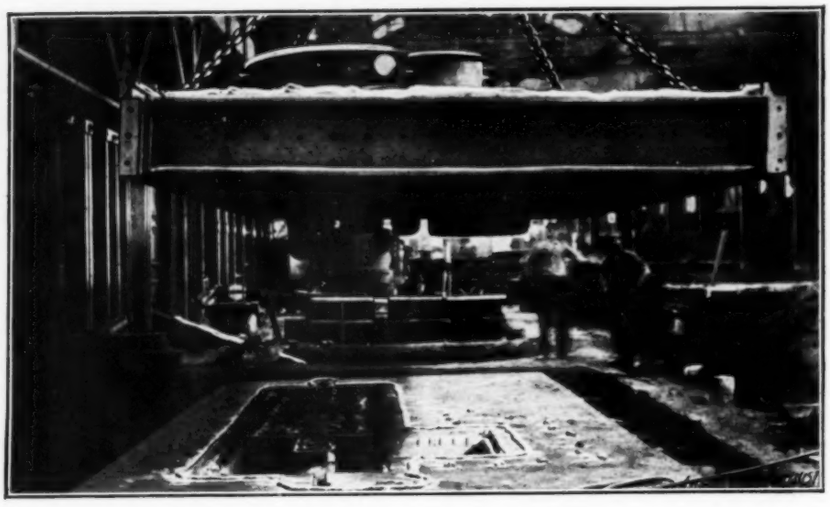


FIG. 5. TESTING FOR COPE BEARING

Figs. 3 and 4 show the setting and arrangement of the cores as the work progressed; Fig. 5 shows this work completed. The four cores suspended from the cope were secured in place by two or more ½- or ⅝-inch hook bolts each. These engaged other hooks or links formed in the core; the bolts passed through the cope, and plate washers that straddled the flask bars were tightened from the top. In Fig. 5 everything is seen ready for the final trying on, a soft dough being used, as shown, to test the bearing of the cope. After lowering down on this, the cope once more was raised and being found all right, it was lowered again for final closing and clamped to the lower part, as shown in Figs. 6 and 7. These views show the completed mold with the flask thoroughly braced to prevent any outward strain of the mold, and sufficiently weighted down to prevent any raise or parting of the flask joints, as will be noted by the amount of material on top.

With the pouring of the metal the casting was completed, and as this, the supreme test of the work, was passed successfully, without the least apparent trouble or disturbance, everybody breathed a little more freely. The satisfactory completion of the job reflects credit to all concerned in the work, and an important factor in this, not previously mentioned, is the management of the furnaces in providing the heat; bringing the metal in each furnace, under very different conditions, to the required heat and carbon point at the same time in order that they might be tapped simultaneously.

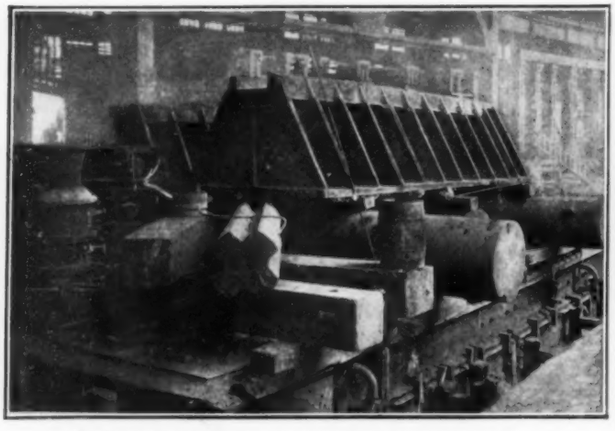


FIG. 6. COMPLETED MOLD WITH WEIGHTS ON TOP

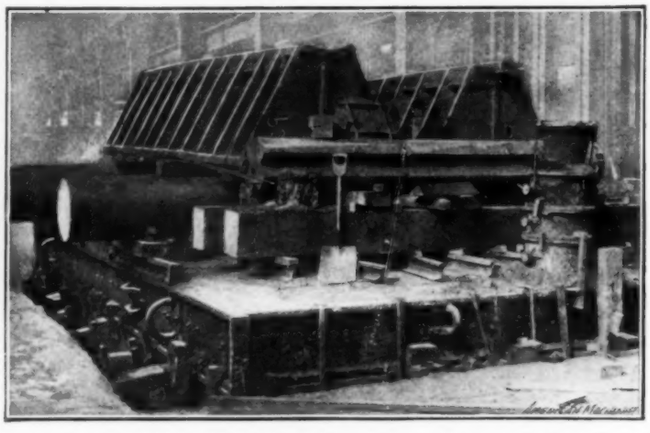


FIG. 7. COMPLETED MOLD, SHOWING BRACING IN PIT

GAS DRYING OF THE MOLD

After the mold was finished it was given a coat of wash and then was ready for drying. This was done by natural gas, there being specially arranged pipe burners connected up for this purpose. The cope was placed over the mold on short blocks and the outside of this closed in with sheet metal. This thoroughly dried the cope, which also retained the heat in the mold. In order to make it thorough, the mold was dried slowly, about a week's time being required for this process.

No one should assume that because a grinding wheel is of fine grain, it will leave a fine surface on the ground piece or because a wheel is coarse it will leave a coarse surface. It has been shown that a fine wheel can make a fine surface and a coarse wheel can make a coarse surface; but it has never been shown that this must follow. In grinding chilled iron with an alundum wheel, for example, on rolls 10 inches diameter and 14 feet long, we can make a mirror finish with a No. 10 wheel if we grind slow enough. If we should use a fine wheel on this work we would leave nothing but fine scratches.—*Grits and Grinds.*

Camming Automatic Screw Machines

By A. Butterworth

A method of laying out cams for the Cleveland automatic machine, whereby the turret and cross-slide tools finish their operations simultaneously. The chart for cross-slide cams gives the angle corresponding to all lengths of turret feeds and depths of forming cuts, so that a glance at the proper curve gives the necessary slope for the cam.

Marking the cams for facilitating resetting for duplicate jobs. A continuous cam ring used in place of segmental cams for regulating the feed mechanism.

No doubt many of the readers of the AMERICAN MACHINIST, who have charge of automatic screw machines, have articles to make on the machines that require a long operation with the forming tool on the cross slide, and short operations with the tools in the turret, and have wished for a method of overcoming the lost time of the turret tools, while the forming tool was in operation. An article of this kind is shown in section, in Fig. 1, and is made on a 2-inch Cleveland machine with the tools in Figs. 2 and 3.

A CAM ANGLE CHART

Some years ago I constructed the chart shown in Fig. 4 for finding the angle to make the cross-slide cams, so that the cross slide tools could be made to start and finish cutting at the same time as the turret tools. From this chart cams can be made that will form a piece continuously, while the turret tools perform their various operations, as will be shown later.

The curves on the chart are for the distance the cross slide travels, and the ordinates are the distances the turret travels, and the angles of the cams.

To find the angle to make the cams, find on the bottom line the distance the turret travels during its cutting operation, trace a vertical line to the curve for the depth of the cut of the forming tool, then trace to the left for the angle of the cam.

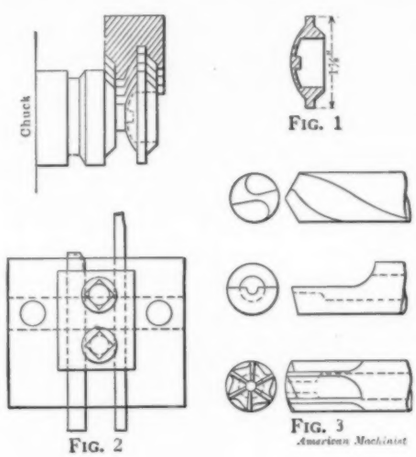


FIG. 1

FIG. 2

FIG. 3

TOOLS FOR MAKING A PIECE IN THE SCREW MACHINE

APPLICATION TO A REAMING OPERATION

When it is required to perform an operation with the turret tool and cut off the piece at the same time, such as reaming a bush and cutting it off at the same time, and where the reamer must be away clear of the piece before it is cut off, use the above method, adding together the distances the turret travels forward and backward, find the angle for this distance and add 5 degrees. This 5 degrees compensates for the difference in the spiral angle of the forward and return cams.

A TYPICAL CASE

To illustrate the method of getting out the cams, we will take the operations in making the piece shown in Fig. 1. This is an article made on a 2-inch machine, from 2-inch mild cast steel. Fig. 2 shows the forming and cutoff tools; these it will be noticed are of the straight variety. Fig. 2 also shows the successive cuts of the forming tool, while the three turret tools perform their operations. The short tool in the cutoff tool holder, is for the purpose of necking down for the next piece to be made, thus assisting the forming tool.

Fig. 3 shows the turret tools without their holders. The first is a twist drill, the second a D bit; this tool turns the bottom of the hole, and forms the small tit. The third tool finishes the hole to size, also the tit and the bottom of the hole to size and shape.

The following are the speeds, feeds and operations in making the piece, Fig. 1.

THE CROSS SLIDE CAM ANGLES

To illustrate the method of getting out the cross-slide cams we will work out the cams for the above operations: The first operation as shown in the list of operations is drill 0.750 inch deep, and part form 0.187 inch depth of cut.

In drilling the turret travels 0.750 inch. On the bottom line of the chart, Fig. 4, find ¾ inch, follow the line vertically, until it crosses the curve 3/16 inch depth of cut, then follow the line to the left of the chart and find the angle of the cam, which in this case is 19 degrees. This cam is marked No. 1 in Fig. 5.

Second operation; feed D bit 0.370 inch up, and form 0.083 inch in. Then feed *D* bit 0.190 inch up and form 0.103 inch. In this operation the turret travels 0.560 inch and the forming tool 0.187 inch. Find 9/16 inch on the bottom line of the chart, follow up vertically to the 3/16 curve, then to the left, and find the angle of the cam, which in this case is 22 degrees. Nine-sixteenth inch not being marked on the chart, will have to be found approximately. The chart has ¼ inch square sections, so that the sixteenths can easily be located.

The third operation is finish ream 0.560 inch up and form 0.126 inch in. Proceed as before, but this time trace the

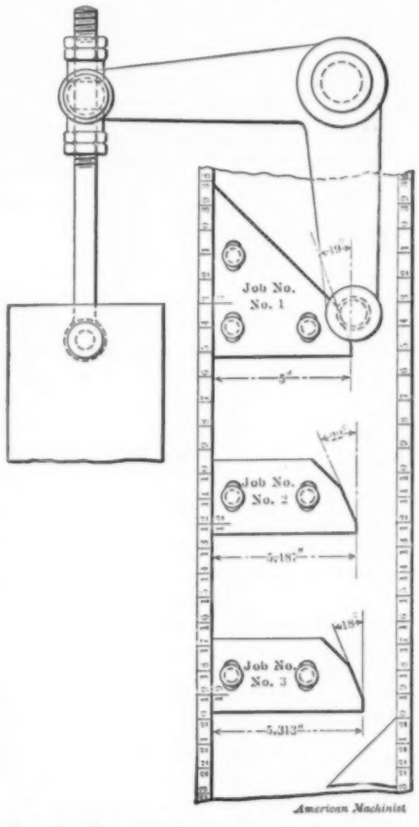


FIG. 5. CROSS-SLIDE CAMS ON CLEVELAND AUTOMATIC MACHINE

vertical line to the curve ⅛ inch depth of cut, and find the angle, which in this case is 18 degrees.

The alteration in the feed during the second operation will, of course, be got by stepping the feed-cam segment.

The cross-slide cams which are of cast iron, and cheaply made, are slotted as shown in the plan view, Fig. 5, which enables the cams to be more readily set to their correct positions so that the cross-slide tools and the turret tools will start and finish cutting simultaneously.

The cross-slide cam drum may be marked as shown in Fig. 5 and the marks numbered.

After the cams are made and fixed in their correct positions, they are marked with the job number, and a mark put on the cam opposite one of the marks on the edge of the cam drum, and the number of the mark stamped on the cam, as shown in Fig. 5.

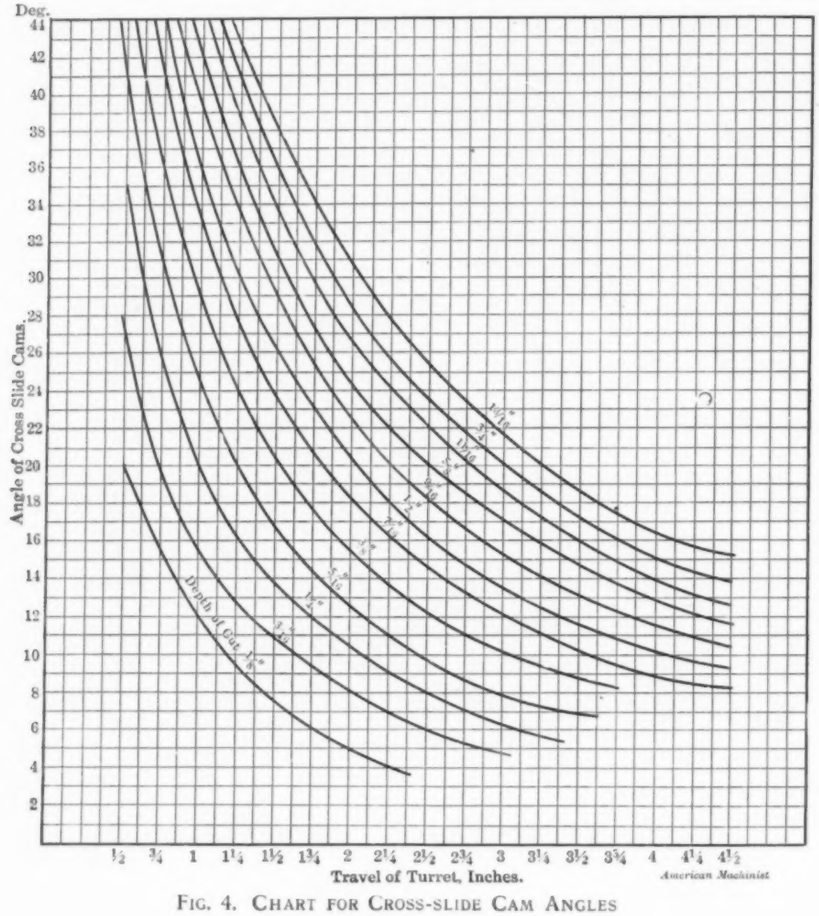


FIG. 4. CHART FOR CROSS-SLIDE CAM ANGLES

FORM OF CAMS

THE FEED REGULATING CAMS

When the job has to be repeated at various times, it has been my practice to make the feed cams as shown in Fig. 6. This is a cast-iron ring made to fit the feed-cam drum, and having steel pegs driven in the back edge, of a length to make the ring stand level with the edge of the cam drum, when the pegs are against the back of cam drum. The ring is held on the drum by 3 set screws.

HOW CAM RINGS ARE MADE

The method of making the cam rings is as follows: Set up the job with the segment cams (these are made of cast iron) and get the correct feeds, stepping the cams where required to change the feed quickly, mark a fine line on the edge of the cam drum opposite the steps filed in the cam segments, note all measurements from the edge of the cam drum where the tools are in operation. Then take off the cam segments and place the cam ring in position, mark off the measurements from the edge of the cam drum and cut out, beginning and finishing the part cut out with a gradual rise and fall. This makes it easier for the roller on the bell-crank lever operating the friction roller.

We now have a duplicate of the feed-cam segments as set up for the job, and this insures the job being cammed up the same every time it is put on the machine. A locating mark should be made on the edge of the cam drum, and on the cam ring for setting the cam ring in the right position every time.

Recovery of tin from tin scrap, used tin cans, old tin pipe, worn driving-box linings, drosses, old solder, bronze, sweepings, etc., in the United States is increasing. From these materials the recovery of tin is commonplace and expected except from used tin cans; in them the loss of tin is enormous. The tin recovered during 1909 as tin amounted to 2423 short tons; in the form of alloys, such as solder, babbitt metal, bronze, etc., 3092 tons; a total of 5515 tons, equal to more than one-ninth of the tin imported into the United States and worth $3,281,425. Besides the money value involved, the world's tin resources were increased by so much—a very real conservation in these days when all sorts of warnings are rife as to the draining of our mineral resources.

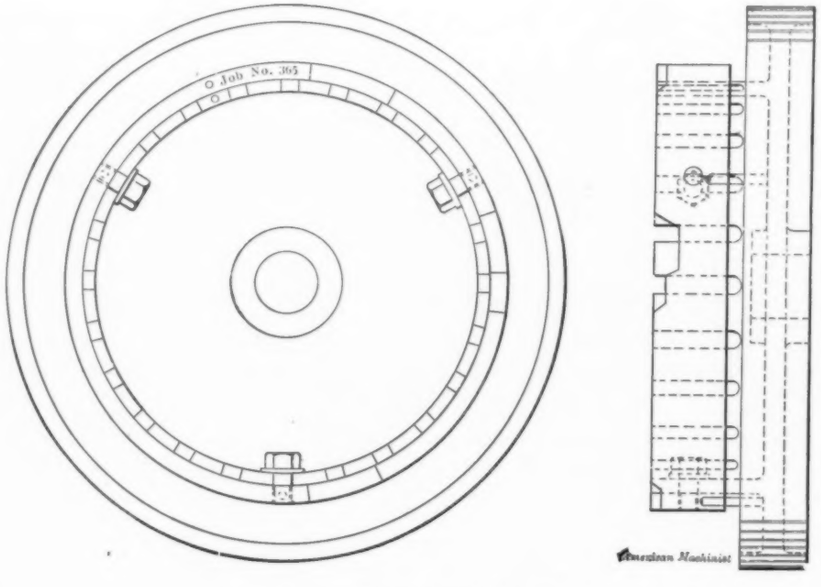


FIG. 6. FEED-REGULATING CAM RING

Designing a Cam for Indicator Motion

By Milton C. Stuart

A system of reversed transference of points to develop the cam while drawing it in only one position.

The problem of producing a straight-line motion, which at all points shall be proportional to the cross-head motion, but reduced in a fixed ratio.

A cam device applied to the engine, to drive the test indicator.

This article describes and explains the method of design of an indicator reducing motion for the low-pressure side of an 8 and 18 by 24-inch, 80-revolution per minute, compound, Harris-Corliss experimental engine in the mechanical laboratory of the Rensselaer Polytechnic Institute, Troy, N. Y.

The one necessary requirement of an indicator reducing motion is that it must so actuate the drum that its motion at all points of the stroke is exactly proportional to the motion of the crosshead or piston; that is, when the crosshead has moved any fraction of its stroke from dead center, the drum has been moved the same fraction of its total motion from one of its extreme positions. Other desirable qualities may be freedom of motion, ease of detachment of indicator cord, and ease of construction and application to engine.

The motion illustrated in Fig. 1 was made to fulfil the foregoing conditions. A 1-inch diameter roller was attached to the wrist-pin oiling device extending out from the center of the crosshead. A cam plate, resting on this roller, was mounted so as to rotate on a pin extending out from the frame of the engine. As the crosshead moves back and forth, the roller causes the cam plate to rock through a small angle, and motion for the indicator is taken from the cam plate at the bottom of the downward projecting arm. Evidently, the character of the motion of the indicator cord attached to the cam depends upon the form of the curve of the cam plate. The method of designing this curve will be given in detail, as it nicely illustrates a general method of cam design.

The length of the indicator diagram desired is assumed to be 3½ inches, and this distance is laid off along the horizontal line *C D*, Fig. 2, tangent to the arc in which the point *P* moves. The indicator cord will be attached to the point *P* and lead to the pulleys *E* and *F*, and then to the indicators, which are not in the plane of the cam. As *E* is the first fixed point through which the string moves, this is the point at which the motion of the string must be considered as being proportional to the crosshead motion. It may be noted that *E* is the point of tangency of the string with the pulley and, as this point changes slightly, *E* is not theoretically a fixed point. But the error involved by considering *E* as fixed is evidently too small to receive consideration.

After the string passes around *E*, it may be led in any direction without changing the proportionality of the motion; but before coming to this first fixed point *E*, the changing angularity of the string would affect the accurate reduction of the motion.

Stroke of the crosshead is represented by *A B*, and we will divide this into eight equal parts. We will assume that, when the crosshead is at the beginning of its stroke at *A*, the point *P*, to which the cord is fastened, will be at *D*. The position of the point *P* for the eight other positions of the crosshead is found as follows: The line *D C*, representing the travel of the indicator drum, is divided into eight equal parts. Through these division points, and from *E* as a center, produce arcs cutting the arc *R P*. These intersections give the positions of *P* for the equal increments of crosshead travel, and consequently represent the corresponding angular positions of the cam plate. From *O A*, angular positions are drawn equal, respectively, to the positions of the line *O P*. Now the angles *A O a'*, *A O b'*, *A O c'*, etc., represent the angular relations which must exist between the cam plate and the line of travel of the crosshead, for the corresponding points of the crosshead travel *a*, *b*, *c*, etc.

We do not wish to draw in the cam plate for each of its angular positions, so we will draw it in only one position, say that corresponding to the extreme

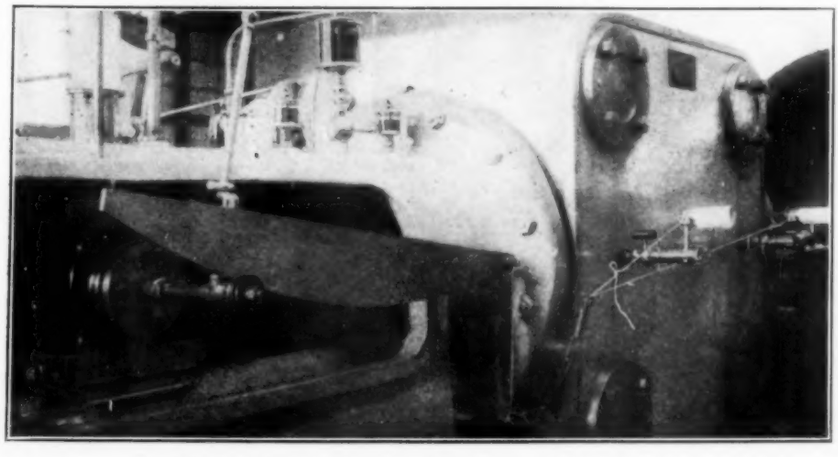


FIG. 1. INDICATOR-REDUCING MOTION CAM IN PLACE

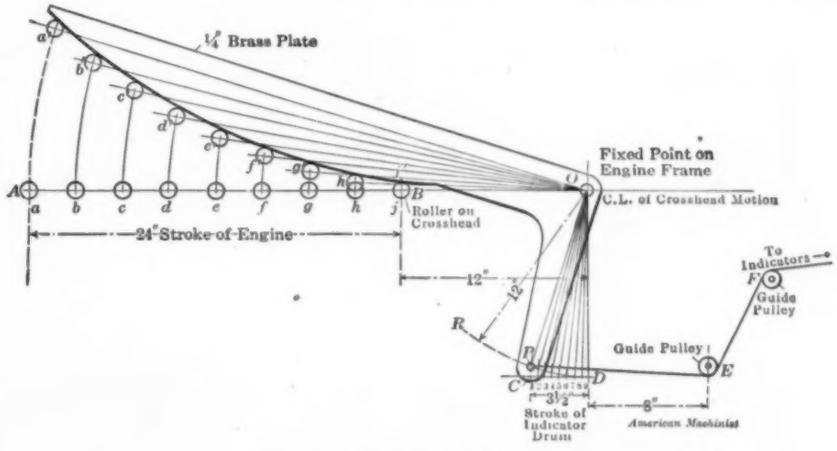


FIG. 2. LAYING OUT THE CAM

right-hand travel of the crosshead, at *B*. A circle with a diameter equal to that of the roller is drawn at *B*. As the cam rests on the roller at this point the cam curve must be tangent to this circle. The next step in the demonstration contains the most essential, though not always the most comprehensive point connected with cam design.

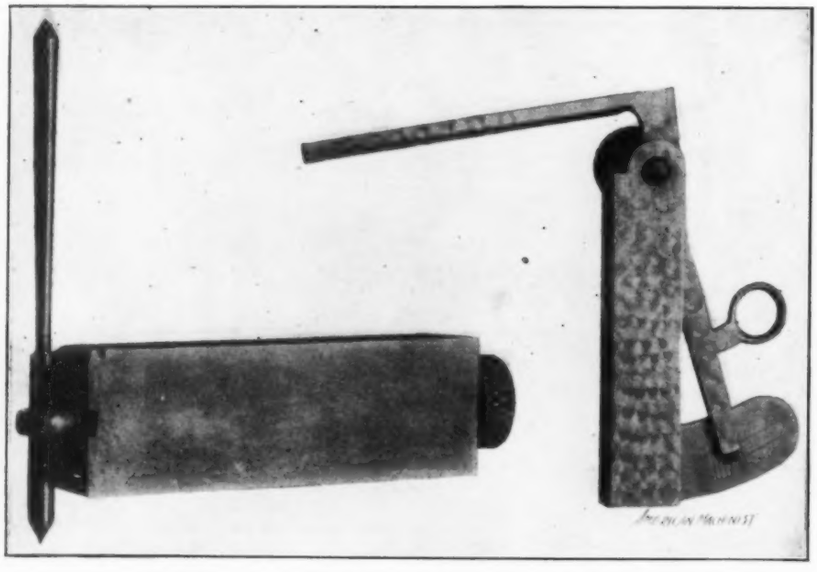
Consider any other position of the crosshead, say that at *d*. The cam plate must be tangent to the roller at this point, as well as in its present position at *j*. But when the roller comes to the position *d*, the angular position of the cam plate must have changed from its position at *j* by the angle $A\,O\,d^1$; that is, there is a linear movement of the roller from *j* to *d* and, at the same time, an angular movement of the cam amounting to $A\,O\,d^1$. But we have said that we do not wish to draw the cam in several different positions. To avoid doing this, we will first give to the roller its linear movement *j d*, and then, keeping the cam plate stationary, rotate the roller through the required angle $A\,O\,d^1$, in a direction opposite to the one in which we wish to have the cam plate rotate. This gives the correct relative position of roller and cam. The 1-inch roller is drawn in at d^1, e^1, etc., and the curve tangent to these circles is the required cam curve. If this conception of separating the linear and rotating motion of cam and follower be clearly obtained, the problem of cam design becomes quite simple.

The motion illustrated is in operation and is found to be quite convenient. The string is easily attached or detached at *P* while the cam is in motion, and the cam plate may be thrown out of motion by hooking up the left-hand side to a standard on the engine. It is noticed that both the weight of the cam and the springs in the indicator drums assist in keeping the plate in contact with the roller. For high speeds, an additional spring may be necessary to insure contact between cam and roller.

Three Toolmakers' Bevels

The illustrations show two forms of diemakers' try-squares which are being used with great satisfaction in the shops of the Underwood Typewriter Company, Hartford, Conn.

The one at the left, Fig. 1, is hardened and ground all over, including the angular groove at the end for holding the round blade.



FIGS. 1 AND 2. TWO TYPES OF TOOLMAKER'S BEVELS

Pins are made straight or with different angles to suit the work being done. Those generally used have angles of ½, ¼ and 1 degree. They are held by the draw clamp operated by the nurled nut at the opposite end.

Another form of square for the same purpose is shown in Fig. 2, right. This has a direct reading scale and the blade can be locked by the thumb nut shown on the back side.

Fig. 3 is a bevel protractor with a micrometer movement over a limited range for final adjustment. The base *A* carries a plate *B* on which are the graduations in degrees. This plate is mortised into the frame and carries on the back, a second ring *C*, which has a projection *D* having rack or worm teeth engaging the micrometer screw *E*. This has a differential thread, the finer pitch being in the head of the adjusting screw.

Loosening thumb screws *F* and *G*, the degree plate can be swung to any desired position, approximately to zero. Then the two plates are clamped together by the screw *G*. The micrometer adjustment is now used to set the degree scale accurately to zero.

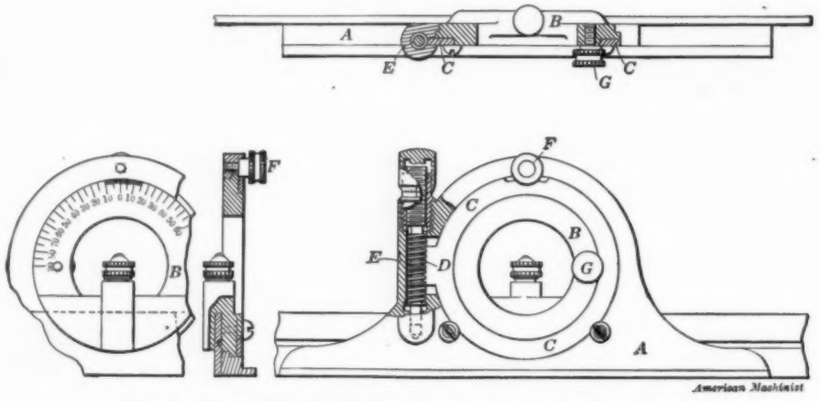


FIG. 3. BEVEL PROTRACTOR WITH MICROMETER MOVEMENT

Tightening thumb screw *F* fastens the degree plate to the base *A*. The screw *G* can now be loosened and the micrometer handle turned to zero. Clamping *B* and *C* together by screw *G*, at the same time loosening *F*, allows the plate *B* to be turned so as to give minute readings. The degree readings are taken direct from the degree plate, while the minute readings are taken from the micrometer barrel.

The micrometer will be seen to serve a double purpose. First to set the bevel accurately to any desired point; and, second, to then move it as many minutes as may be required. This was patented by John Murdock and Victor L. Lenard in 1905.

Insufficient Terminal Facilities

The lack of terminal facilities seems to be a universal complaint and was the topic of the ninth annual dinner of the Canadian Railway Club in Montreal. This lack of terminal facilities affects every shipper and user of material of all kinds.

This club is one of the most active on this continent and includes the best known railway men of Canada. A number of guests from the United States attended the annual meeting.

Turret Lathe and Other Tools

By F. A. Stanley

Special equipment for machining spur- and bevel-gear blanks, including combination tools for performing several operations at once, and some inserted flat facing cutters. Handling a bronze bushing in an eccentric chucking ring for an unusual machining operation, and the application of some expanding cutter boring bars to the finishing of accurate holes.

A three-jaw chuck for the automatic turret machine adapted for holding bar material of square section. Double-pointed scribing appliances for laying out T-slots, bolt-hole circles, etc.

At the plant of the King Machine Tool Company, Cincinnati, Ohio, a great deal of the work in the way of gear blanks, bushings, etc., is handled in an interesting manner upon turret lathes, and a number of the views in the present article are illustrative of methods of producing such parts.

In the halftone, Fig. 1, a number of gear blanks, bevel and spur, will be noticed in the background; and to the left, in the foreground, are two bronze bushings, which are representative of different lines of turret-machine work. The tools shown are of special design, constructed at this shop, for facilitating the machining of work of the character illustrated.

Operations on a Friction Gear

The blank *A*, Fig. 1, is for a cast-iron friction gear for the rail box of a vertical mill, and a section through this blank is shown in Fig. 2. It has a conical friction surface, formed at an angle of 10 degrees on a side, and is provided with external and internal oil grooves around the hub. It is shown in Fig. 3, as machined in a Jones & Lamson flat turret lathe, some of the tools in the turret in this view being represented more clearly in Fig. 1.

At the outset the gear blank is a solid disk. It is first chucked by the projecting hub, and the outside diameter and the back face roughed, and the hole rough bored. In the second operation the blank is held as in Fig. 3, by the rim with the hub out, while the end of the hub is rough faced; then with the combination tool *B*, Figs. 1 and 3, the face of the blank is turned out to rough form the conical friction seat, the same tool simultaneously facing the gear rim and the end of the hub, and rough turning the whole length of the hub. The tool is really in the form of an inserted-blade hollow mill, and while the outside edges of the blades are cutting out the taper seat for the friction bearing, the inner edges are turning the hub. The cutters for facing the rim and the end of the hub are inserted midway between the hollow milling blades.

Finishing Operations

The outside of the hub is finished to size and the internal bevel surface finished with the tool *C*, Figs. 1 and 3, which consists of a flat cutter inserted in a suitable holder, the front of the cutting tool having a projecting lip for operating upon the hub, while the opposite face of the tool is formed to the angle which is required on the conical friction surface. After the bore is finished to size the inside and external oil grooves are formed in the hub.

The third operation on the work consists in holding the piece by the hub for the finish turning of the outside of the rim. The tools for the different cuts on the blank in the three operations occupy all the stations on the turret and in several instances, as will be understood, they are used in conjunction with the cross-feeding movement of the head, as in turning and boring to size, forming oil grooves, etc. Special attention is called

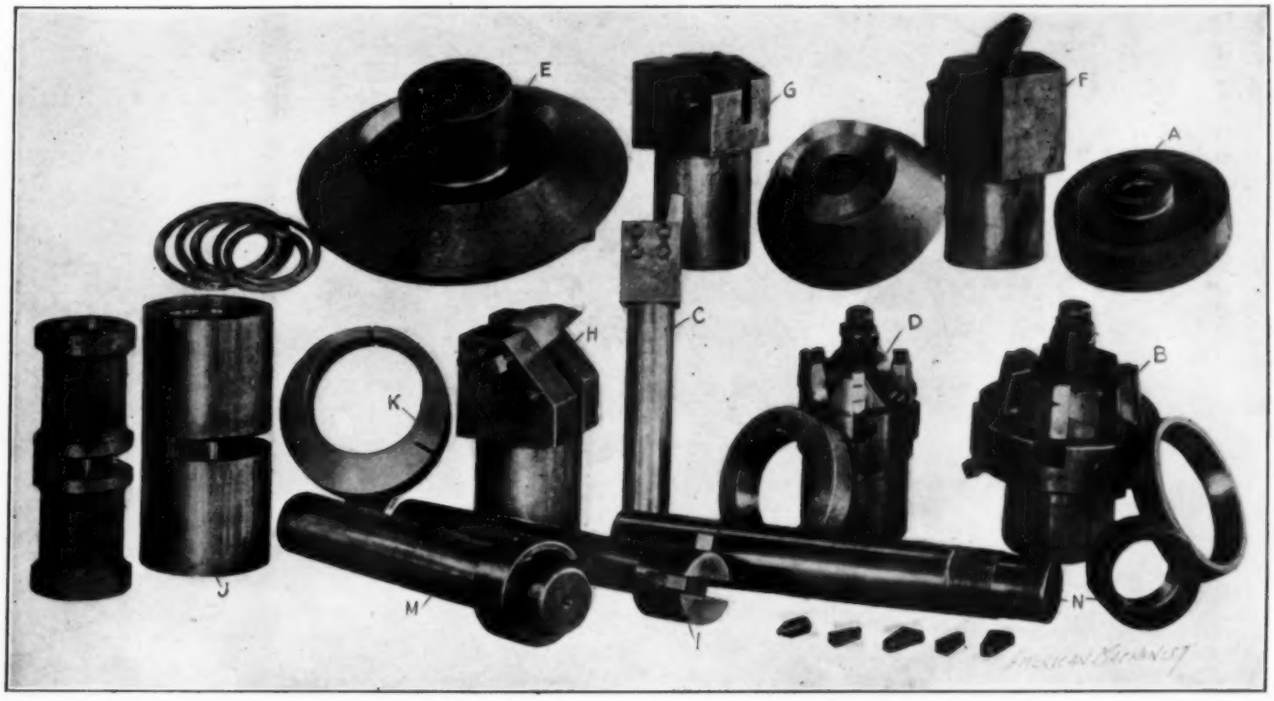


Fig. 1. Turret-lathe Work and Special Tools

here, however, only to the combination tools and others of the inserted-cutter type like *B* and *C*, and certain others to be referred to more fully in connection with Fig. 1.

The Combination Cutter Heads

The two tools *B* and *D*, Fig. 1, are of practically the same design, but for different sizes of work, and the inserted cutters in head *D* are provided with serrated edges for breaking up the chip. This type of tool is used in various sizes for turret-lathe operations and is so proportioned as to give good, stiff cutting blades and at the same time provide ample chip clearance. The pilot in the tool is adapted to carry a boring cutter as illustrated.

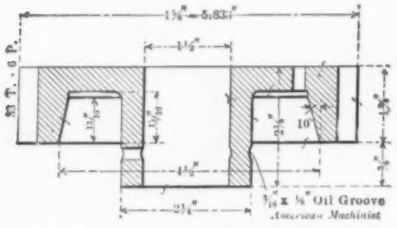


Fig. 2. Friction-gear Blank

The ring shown leaning against each head is a gage to which the cutting blades are ground. The interior of the gage is to the same taper as the outside of the cutters, and in grinding, the outer ends of the blades must come just flush with the face of the gage when the latter is placed over the cutter head.

Machining a Bevel-gear Blank

The cast-iron bevel-gear blank in the machine in Fig. 4 is shown at *E*, Fig. 1, and its principal dimensions are given in the sketch, Fig. 5. It is first chucked by the long hub, while the inner end of the hub at *a* is roughed off, the entire back face *b c* roughed out and the hole rough bored. In the second operation the work is held with the long hub out while the entire front face of the gear is roughed; then the bevel face *d* and back bevel *e* are finish formed, after which, with a single tool, the end of the hub is finished at *f*, the outside diameter *g* brought to size and the face *h* finished. Next, the bore is finished to size. The third operation consists in reversing the blank again in the chuck and finishing the whole inner or back face.

The Tools Employed

Some of the tools used in the turret for these operations are seen in place in Fig. 4, and a number of the special forming tools with inserted cutters for the various bevel surfaces are also included in the group illustrated by Fig. 1. Three tools of this pattern will be seen at *F*, *G* and *H*, and another is shown in Fig. 4 lying upon the head of the machine. These broad, flat tools are secured in heavy steel holders and are held rigidly to the cut.

A tool similar to the one shown at *G* is used for finishing the broad front bevel surface of the blank, and the inserted cutter is, in this case, a little over one-half the width of the bevel face so as to divide the work into two cuts. A tool like that at *H* is adapted for reaching behind the edge of the work to finish the back-angle surface for the outer ends of the teeth. The tool *I* is shown in contact

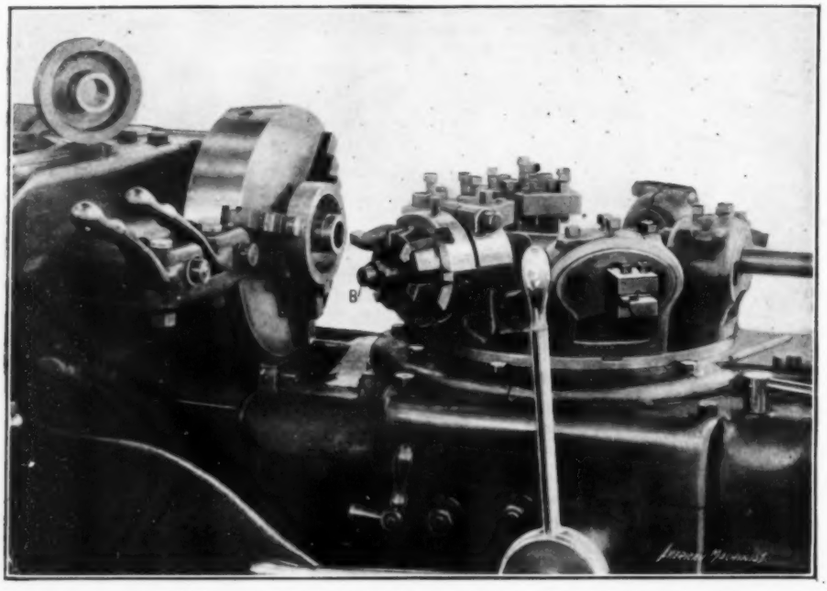


Fig. 3. Machining a Friction-gear Blank on the Flat-turret Lathe

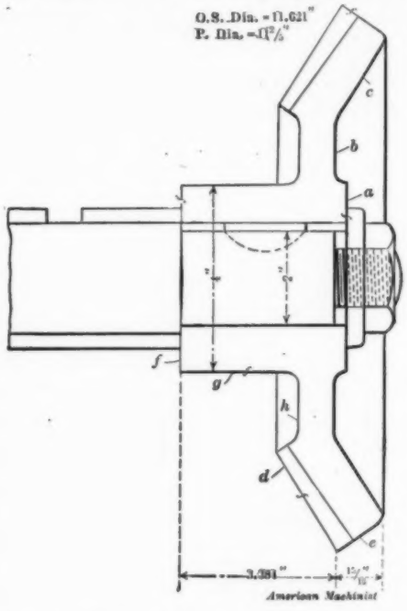


Fig. 5. Bevel Gear for Driving Head

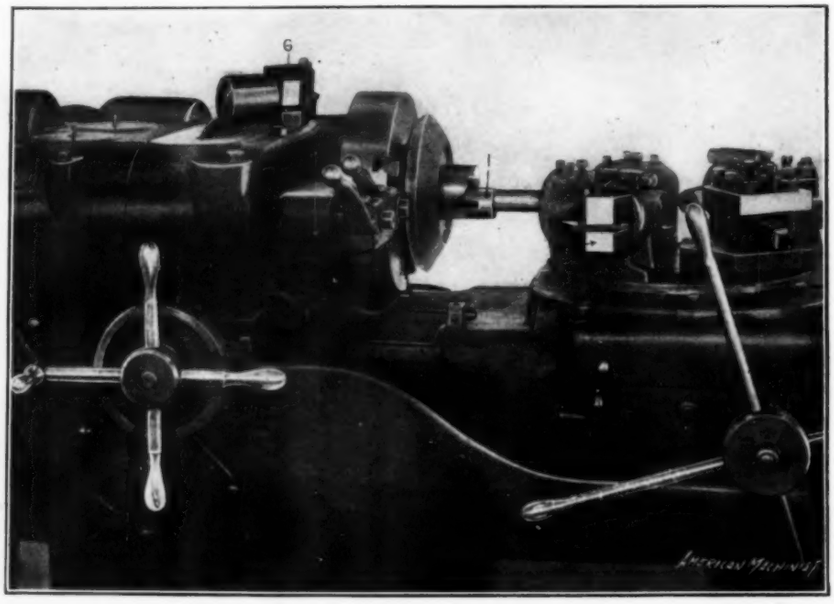


Fig. 4. Machining a Bevel-gear Blank

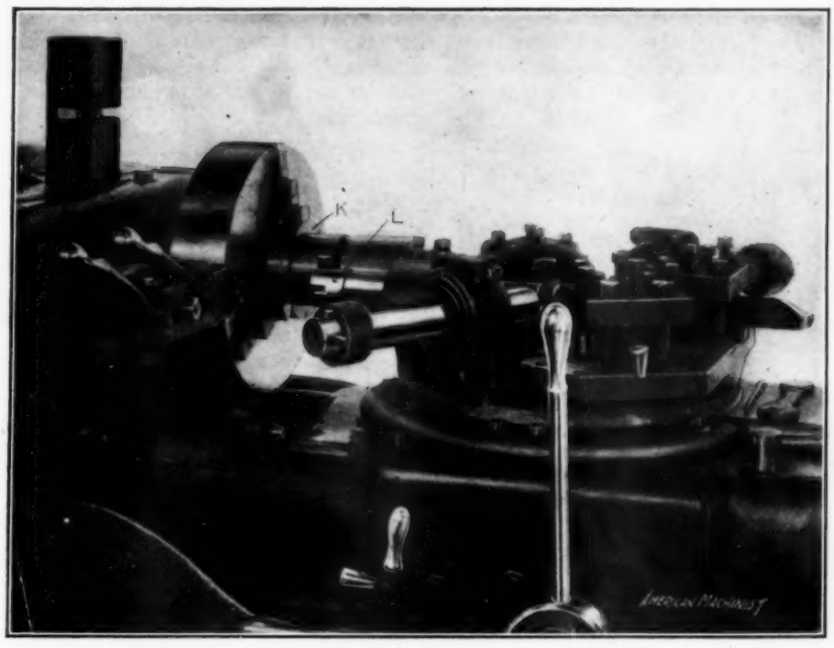


FIG. 6. MACHINING A PECULIAR BRONZE BUSHING

with the hub which it finishes to diameter; this tool also finishes the end of the hub and the undercut face of the blank at *h*, Fig. 5. It is a simple cutter inserted in a holder with a slotted, eccentric head, as represented in Fig. 1.

The roughing of the work is accomplished mainly with the actual forged tools, one of which will be noticed in its holder on the turret in Fig. 4.

A smaller bevel blank is shown in Fig. 1, which represents another size in the series of gears which are machined with tools of the kind illustrated.

stop on the dial may be set the corresponding number of graduations away from the fixed zero line, so that upon turning the feed screw to bring the adjustable stop line again coincident with the zero line, the work will be reduced exactly to size. This setting of the sight stop then suffices for a large number of pieces, or until the tools become worn.

A PECULIAR BUSHING JOB

The piece of work in Figs. 6 and 7, is a bronze bushing forming a bearing for a driving-head shaft, and requiring in the process of machining some unusual operations, as for example, the taking of an eccentric cut *i* at the center, and the production of a straight oil groove *j*, extending from the annular oil channel *k* to the opposite end. The bushing is made in several sizes, varying slightly in external appearance, and two different sizes will be seen at the left side of the photograph, Fig. 1, the example *J* corresponding with the bush in the line drawing Fig. 7.

In the first operation the rough casting is held in the chuck by one end, the outer

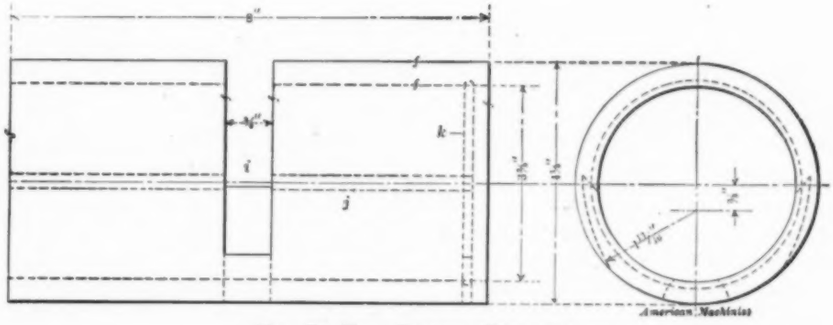


FIG. 7. THE BRONZE BUSHING

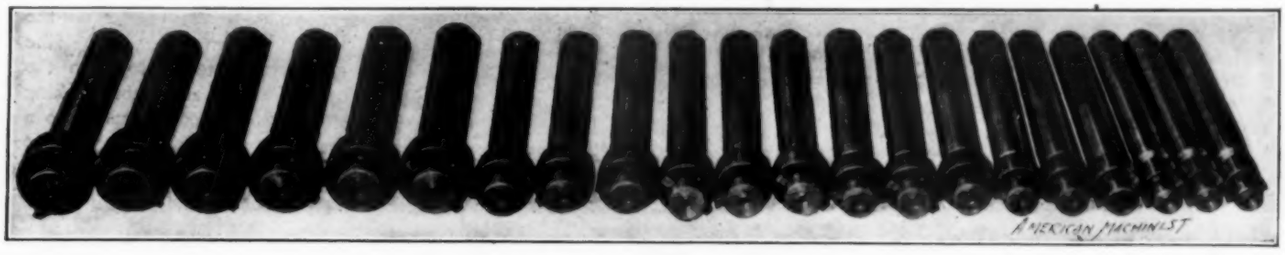


FIG. 8. OUTFIT OF INSERTED-CUTTER BORING BARS FOR TURRET-LATHE WORK

MICROMETER DIAL FOR THE CROSS FEED

An interesting form of micrometer dial is illustrated in Fig. 4, as applied here to the cross-feed screw for the head. This dial is graduated to read directly in thousandths and is slotted to carry a series of adjustable indicating or sight stops corresponding to the different stations of the turret. In bringing a piece down to size, if so desired the part turned may be calipered, and upon noting how many more thousandths of an inch reduction is required, the proper indicating

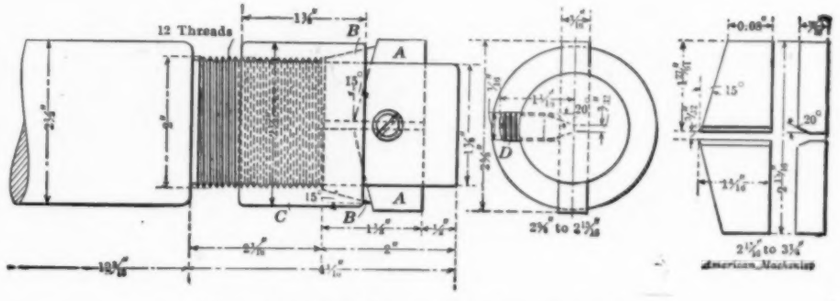


FIG. 9. EXPANDING-CUTTER BORING BAR

end squared off, the hole rough bored and the outside rough turned. For the second operation the eccentric holding ring *K* is slipped over the turned end of the bushing and gripped in the chuck jaws as illustrated in Fig. 6. This throws the bushing off center and allows the opening *i*, Fig. 7, to be formed in the side by a square-ended tool carried in holder *L*, Fig. 6. This eccentric cut removes the metal nearly half way around the bushing and provides an opening for an oiler ring, several of which are shown in Fig. 1, directly above the bushing *J*.

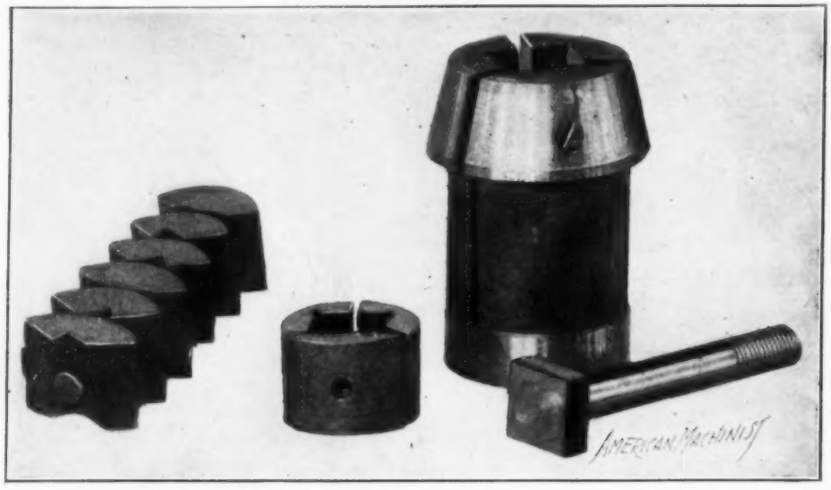


FIG. 10. CHUCK JAWS FOR AUTOMATIC-TURRET MACHINE

FINISHING PROCESSES

In the third operation the bushing is held again in the chuck, a boring cut taken through the interior and the end faced. The outside is turned to 0.010 inch of size, and the oil channel formed near the end at *k*. A shallow concentric recess is turned in the bore directly under the concentric cut at the middle of the length, to prevent the boring cutter from springing upon reaching the opening cut through the wall and the finishing boring cutter is then run through the bushing. The last cut in the turret lathe is the straight oil groove *j* which is formed with a turret tool with a suitable lip which is pushed right through the work while the latter is held stationary, this being really a planing operation. The bushing is then ready to turn to size on an arbor in the engine lathe.

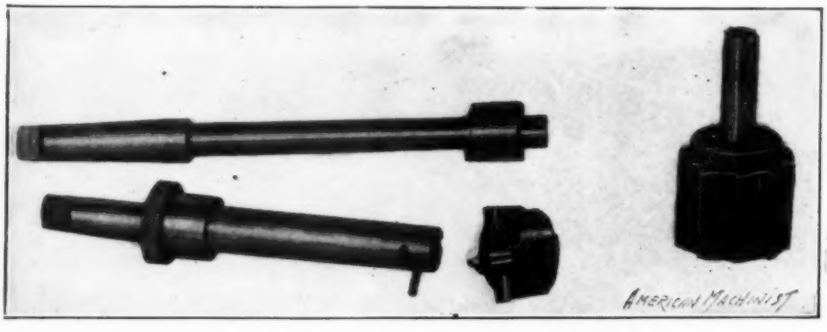


FIG. 11. BACK-FACING TOOLS AND A REAMER

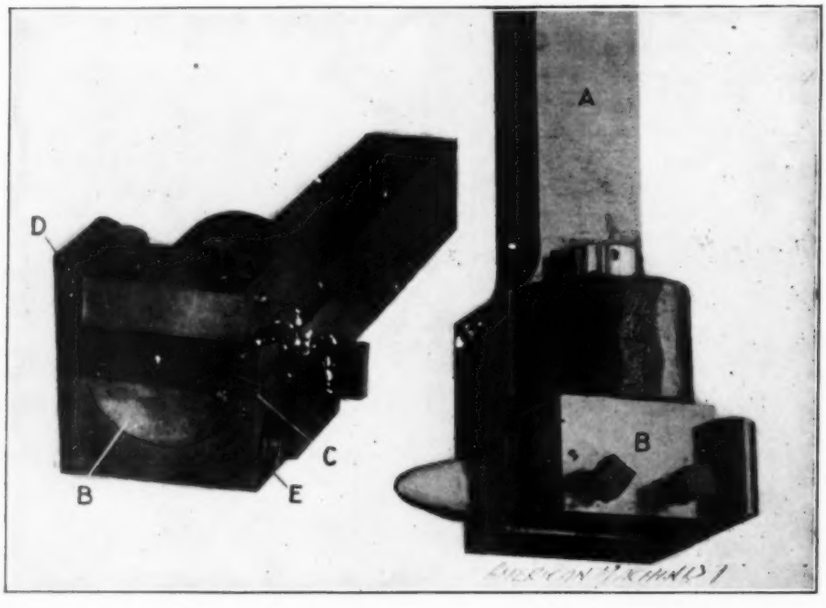


FIG. 12. PLANER UNDERCUTTING TOOL WITH RELIEVING MOTION

BORING TOOL CONSTRUCTION

The turning and facing tools on this work are of customary form, as seen by Fig. 6. The nature of the tool L for the eccentric opening through the wall of the bushing has already been explained. The boring bars with expanding cutters are of an original design embodying features of novelty and are made up in a complete range of sizes covering all the work regularly handled on these turret machines. The outfit of cutter bars as kept in the tool room for regular use is shown in Fig. 8. One of these tools is seen at *M* in the foreground of the group in Fig. 1 and at *N* the bar is represented with the cutters, locking ring and wedges removed.

The drawing Fig. 9 shows all the details of construction. The back edges of the two cutters *A A* are formed at an angle of 15 degrees and rest against two hardened wedges *B B* the faces of which are at the same angle as the backs of the cutters, while the outer edges of the wedges are beveled to conform to the conical interior of the adjustable locking ring *C* which is threaded internally to a nice fit upon the threaded portion of the cutter bar.

CUTTER ADJUSTMENT

The inner ends of the two cutters are beveled to the angle of the cone-pointed headless screw *D* and by means of this screw the cutters are expanded in the slot in the bar to the desired size. When the hardened ring nut *C* is adjusted against the shoes or wedges *B B* these are pressed in hard against the angular edges of the cutters and the latter are held positively against movement in any direction. This design of bar not only makes possible a very rigid construction, but also provides for ample adjustment so that each cutter bar will take care of a liberal range of work where desired.

The cutter bars in the equipment, Fig. 8, are arranged in sets of three each, and the total range covered by the outfit is

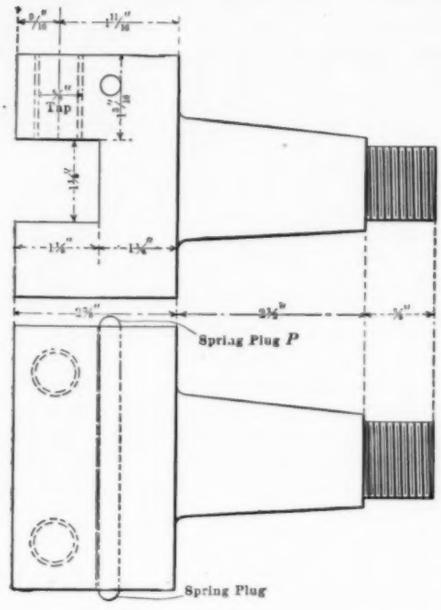


FIG. 13. TOOL HOLDER USED IN UNDERCUTTING TOOL FOR PLANER

from 1 11/16 to 3⅛ inches. The cutters hold right to size and in the case of such work as that illustrated in Figs. 6 and 7, the cutters in the second bar are set to leave only a few thousandths for finishing and the last bar then produces such a smooth, accurate hole that no reamer is required.

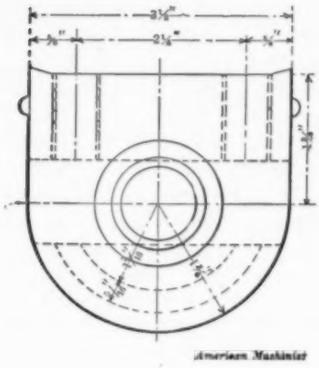
SPRING COLLET FOR SQUARE STOCK

Some other tools of a somewhat different nature are shown in the engravings, Figs. 10 to 14.

Fig. 10 represents a three-jaw spring chuck for a Gridley automatic machine, adapted for holding square stock. The way in which the three inserted jaws are arranged for gripping four-sided material is shown so clearly as to need no explanation. An extra set of chuck inserts is shown near the spring collet, and a complete set of jaws for chuck and feed tube will be noticed at the left-hand side of the engraving. The jaws when not in use are kept in the tool room in racks with a large wire nail slipped through the holes in the jaws so that the entire set for any given size of material is always readily located and there is no danger of any member of the set becoming separated from the others.

BACK FACING TOOLS AND A REAMER

The two tools to the left in Fig. 11 are used in the drill press for under- or back-facing operations and the method of attaching the cutter to the bar will be understood at a glance. The cutter in the foreground is so formed as to provide ample space for chips, and for sharpening. The cutter on the other bar is provided with teeth at each end so that it may be used either side out.



The reamer which is shown in the same engraving, is a floating tool for machine operation. It is also an expansion tool as the reamer shell is mounted upon a taper body, large end out, and when the nut on the threaded shank is operated, the split shell is forced up on the taper bearing and expanded. The screws through the side of the reamer shell pass through openings elongated sufficiently to permit the necessary end movement in expanding the reamer.

UNDERCUTTING TOOL FOR THE PLANER

Two undercutting tools with relief movement for the planer are illustrated in Fig. 12. A number of these tools have been made for the various planers in this shop and they have proved very satisfactory. The holder for the tool has a shank passing up through the lower end of the heavy steel body and the tool block is adapted to rock on the return stroke sufficiently to relieve the cutting point.

The tool holder proper is represented by Fig. 13, and as there shown, it is provided with a large taper shank which fits the hole bored in the enlarged portion of the bar or square shank, and at the upper end of the tapered bearing there is a straight thread for the reception of two round nuts which will be seen in Fig. 12. The squared bar or shank *A* for the whole tool, is 2¼ inches on a side and the length over all is 16⅞ inches. The opening in the tool holder is 1¼ inches square and the whole affair is a heavy tool designed for severe, every-day service.

ACTION OF THE TOOL

The rocking tool holder *B* takes a substantial bearing in the semi-circular seat and during the cut the planing tool bears solidly upon the shoulder *C* at the front of the tool bar, against which it is held by a spring plunger *P*, Fig. 13, that presses against the inner face of the hook-shaped strap *D*. This attachment, by the way, also helps to stiffen the tool under action, as the hooked end then engages the upper corner of the tool holder, as indicated in the halftone. Upon the return stroke of the planer, the spring plug permits the tool holder to rock back in its seat sufficiently to relieve the cutting edge.

Of the two tools in Fig. 12, one is shown set right hand, the other left. Both may be set either hand, however, by simply removing a screw from hook *D* and transferring that member to the other side of the tool bar. The recess at *E* is formed in both sides of the bar and admits a circular boss on *D* so that it may be applied with ease to either side of the tool. There is, of course, a spring plunger at each side of the tool holder so that it operates equally well from either side.

LAYING-OUT INSTRUMENTS

Still another interesting appliance is shown by Fig. 14, which view includes, in fact, a number of scribing tools for laying out such work as saddle T-slots, etc., where it is desired to mark the outline of both sides of the slot. In scribing, say, these slots on the face of a boring-mill saddle preparatory to machining

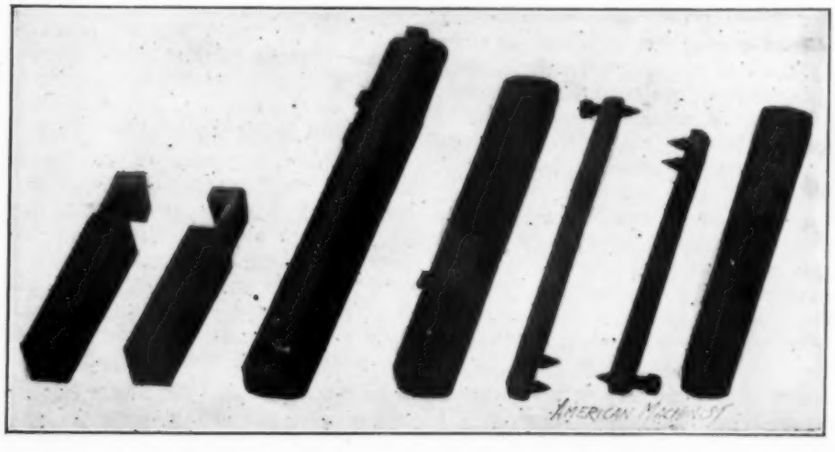


FIG. 14. TOOLS FOR LAYING OUT AND CUTTING T-SLOTS

away the metal, the single center point is placed in a prick-punch mark and the double points swung around to scribe a pair of concentric circles. The center about which the instrument is swung is adjustable for hight to enable the two scribing points to bear with equal pressure upon the surface of the work.

These tools have been made to suit every size of layout of this kind required in the shop, the center distances between the points assuring the correct radius for the scribed circles and the right width for the slot established between the two concentric circles. Each scribing tool is mounted for safe keeping in a wood block, which also carries a gage for testing the slot when cut.

The two tools at the left are standard undercutting tools used in the boring mill in finishing the bottoms of the T-slots, and are kept to the required dimensions for the cut.

The Board System of Blueprint Record

By I. C. Hall

Every responsible man in a manufacturing plant will at once concede the wisdom of keeping accurate record of the whereabouts of the prints issued from the drawing office to the shop. To be able to locate all copies of a drawing when a change has been made is highly important. If even one copy escapes correction it may bob up at an unfortunate time and cause trouble for all concerned.

Many drafting rooms, especially in small- or medium-sized plants, forego any system toward this end because of the labor they involve, and depend upon memory or questioning to find prints when wanted.

Two common methods are in use for keeping track of drawings sent out in the shop by the drawing office; namely, the card-file system and the requisition system. The former generally consists of a card file containing cards bearing numbers corresponding to the drawings and arranged in numerical order. When a blueprint is given out, the card corresponding in number to the drawing is marked with the date, receiving department's name and other sundry information which that particular office may deem necessary. When the print is returned, a cancelation of some sort is made upon that entry.

The second method, that of the requisition system, requires that every request for a blueprint be accompanied by a signed order from some engineer or foreman. These signed orders are then filed away in convenient receptacles, and upon the return of the print the requisition is destroyed. Knowledge as to the whereabouts of prints checked under this scheme is obtained by looking over the requisitions.

Sometimes the two methods above mentioned are combined, but little seems to be gained by so doing except introducing more red tape into the office.

The board system of checking is designed to reduce clerking and recording to a minimum, and at the same time give the desired information in the quickest possible time. It involves no writing, either upon the part of the shop force or the draftsman, and requires no special blanks or forms and through its use it is impossible for a superseded or otherwise bad drawing to get into the shop, even with an inexperienced operator.

In this system the chief requisite consists of a panel or board covered with paper and shellacked, into which are driven long wire brads or hooks. Each hook or nail is numbered consecutively, with the corresponding number of a live shop drawing. All superseded and obsolete drawings are not set down, nor are numbers of drawings which for politic reasons should not go out into the shop. After a careful selection of drawings by someone in charge, it is an easy matter to instruct whoever may attend the distribution of prints to give out only the ones having a place on the board, and no others. Thus a green man is relieved of all chance of error in this matter and can give them out without having any intimate knowledge of their contents.

A number of checks bearing the name or number of the various departments, with a divided box to hold them, complete the outfit. Metal checks may be purchased very cheaply from tag manufacturers in case shop facilities in this line are limited, or they may be made of bristol board and varnished.

The method of operation is almost apparent. When a print is given out to anyone, a check bearing the number of the receiver's department is hung upon the hook corresponding in number to the drawing and which stays there until the drawing is returned.

A board 3x5 feet in size will take care of one thousand different prints, and one standing in front of it can locate at a glance any particular drawing and the department having copies of it.

The checks, of course, do not give the date, the name of the draftsman who made the drawing, the checker nor other like data, but where such information is once placed on the drawing records, it is hard to see the need of writing it all out hundreds of times a week, when the real point is "Who has the prints, and how many?"

In the matter of time saving it commends itself, when compared to the more burdensome methods of searching through card files or stacks of requisitions, which the other systems involve, say nothing of their up-keep.

Success from a Little Thing

By A. L. Pratt

It was a small shop and their first heavy, modern milling machine had just been started. The work that required this addition to the equipment was milling a series of slots in some steel forgings 5/16 inch thick and 1¼ inches wide. The slots were ¼ inch wide and ½ inch deep.

In keeping with the heavy machine a that would take some 50 or 60 of these rugged milling fixture had been made pieces in two strings, placed end to end, and separated by a heavy projection from the fixture's base. To carry the idea of modern milling still further, high-speed steel cutters from one of the best known manufacturers in the United States were purchased and made up into a gang on a stiff short arbor.

Work was finally started and difficulties were met. A speed and feed were selected that were recommended as right for milling soft steel with high-speed steel cutters, plenty of lubricant was used, but evidently this combination was not adapted to those particular conditions, for teeth began to break out of the cutters; so the feed was cut down until the teeth stood up—but the chattering was something awful. Enough, as the milling hand said "to shake down the whole shop." The firm that furnished the milling machine was known to keep an expert operator in a nearby city, and this man was telephoned for. He came over, looked at the job, counted and revolutions of the spindle, examined the feed, felt of the cutters, and said that as far as he could see both feed and speed were all right. He stayed around a little longer, looked wise and finally left without having offered a single suggestion that was of help.

Thus things were left just where they started, or, as the foreman said "It's still up to us." The fixture was so constructed that two heavy straps held the pieces down, while a ¾-inch screw at the end was supposed to press them tightly together. But if they were tightly pressed together, how did it happen everything chattered so horribly? The foreman puzzled over this apparent contradiction for a little while, scratched his head, and finally picking up a hammer tapped the pieces lightly, at the same time that the screw was being turned to squeeze them. This proved to be all that was required. With the tapping enough pressure could be put upon the screw by using a 6-inch wrench to hold everything securely.

Now the milling machine hand keeps his hammer handy, and the job is progressing to everyone's satisfaction.

Letters from Practical Men

Concerning the details of making things in machine shops, from the first sketch to the shipping room. A letter good enough to print will be paid for. The value is in the idea—not the length of the letter

Boring Air Hoist Cylinders

A boring bar and cutter head used in boring out pipe or tubing for the cylinders of air jacks or hoists, is shown in the accompanying cut. The bar itself is made of square stock planed smooth on all four sides, and has a taper turned on one end for the cutter heads, which run from 4 to 18 inches in diameter, while the other end is bored out for the taper end of an extension which is used on work up to seven feet in length.

The cutter head has a slot across the face for two tools, which balance and steady each other when cutting. Four openings are also provided into which are driven pieces of oak, which are turned the size of the finished cylinder, giving steadiness to the cutter head and the polish of a gun barrel to the bore.

In getting the pipe ready to bore, it is first threaded on each end and the flanges screwed on. One end is then placed in the lathe chuck and the other in the steady rest; next the outer end is bored out to size with a common boring tool and in far enough for the wood blocks to enter nicely, after which the bar and cutter head are placed in position and the job finished.

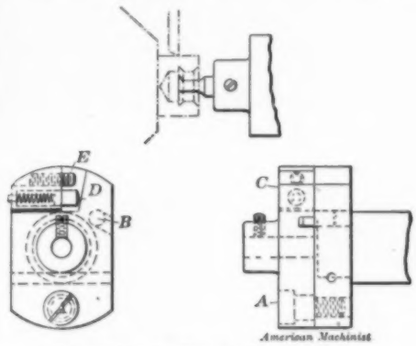
Lubricant is supplied to the cutters through a small copper pipe, from the tank on the end of the bar, as shown.

Clinton, Iowa. CHARLES MARKEL.

An Inside Chamfering Tool

The inside chamfering tool here shown is well worthy of consideration. It is used for small nuts and washers as small as 0.093 inch 64 threads tap size, and as it saves an extra operation of countersinking after leaving the automatics, will soon pay for itself, because the countersinking or burring on small washers is as costly as making them. I know of one that is being run almost continuously on small hexagon brass nuts.

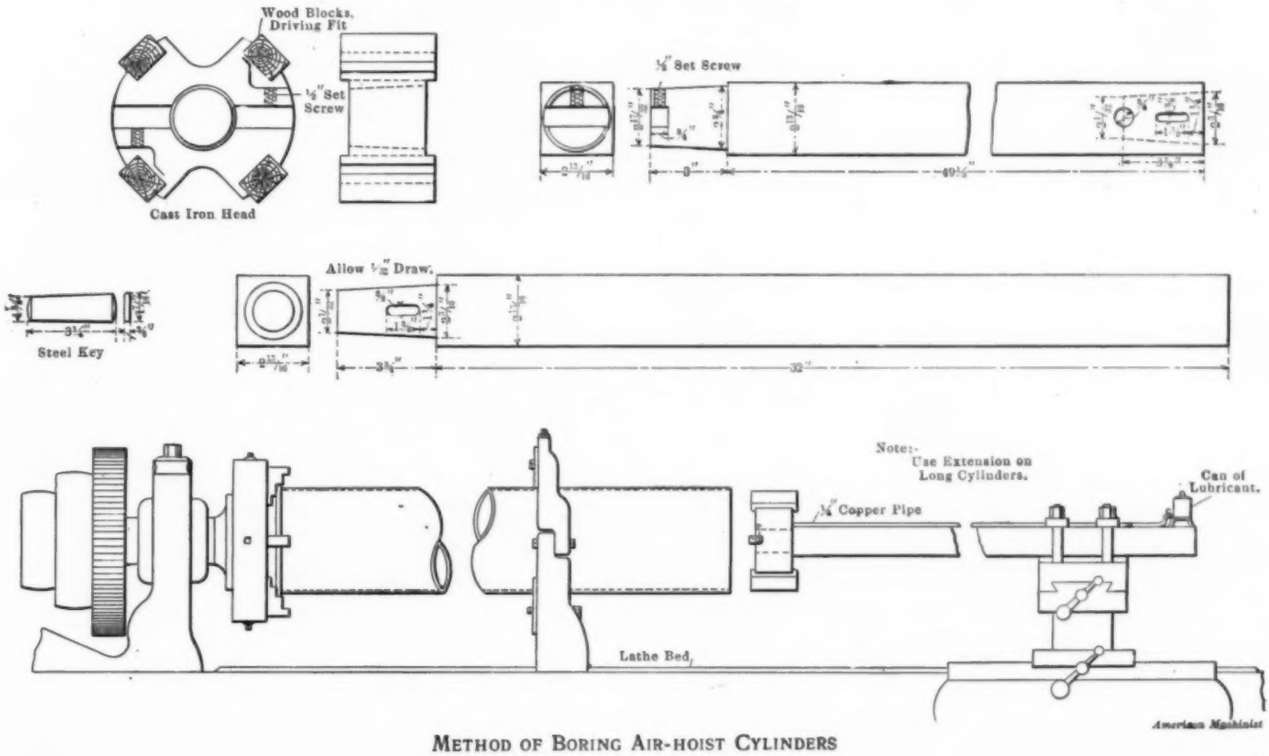
The nose piece that holds the cutter is made to swivel on the large shoulder screw *A*, and the spring and plunger *D* keep the nose piece *C* normally against the stop pin *B* in the slot on the under side. The front cross slide carries a post which comes in contact with the upper end of the nose piece and pushes it to one side, causing the cutter to cut a groove inside the part. The spring plunger returns the nose piece and the tool is removed. The cutoff tool then cuts the part off just at the point of this groove.



AN INSIDE CHAMFERING TOOL

The screw top *E*, shown above the plunger, is set for the amount of cut desired.

Philadelphia, Penn. C. A. T.

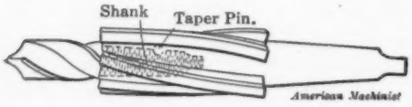


METHOD OF BORING AIR-HOIST CYLINDERS

A Counterbore

The line cut shows a counterbore made from a piece of one of the drawn sections of steel made by the New Metal Tool Steel Company, Portland, Me.

This is one of the many uses to which



A COUNTERBORE

the special shapes can be put. The twist drill is fastened in place by a taper pin as shown.

New York. L. A. S.

Jigs for Making Flue Expanders

The accompanying line cuts illustrate a method in use at the Clinton, Ia., shops of the Chicago & Northwestern Railway, which was suggested by M. O. Jensen. By this method duplicate parts may be made very cheaply with little skill on the part of the machinist, and the procedure is as follows: Cut from a bar of tool steel of suitable diameter a piece the correct length, drill a hole through the center, ream with a taper reamer, bevel both ends and then clamp it between the hollow washers on the tapered mandrel. It is next placed between the centers of a milling machine and split into eight equal parts with a ⅛-inch saw, after which the eight pieces are held together between hollow washers in a similar way on another mandrel and turned to the right shape and size.

Parts of expanders made in this way are interchangeable and no care is needed in assembling them. Before this method was adopted, we used to drop forge each section, bevel in a shaper and then sweat the sections together and turn, which was very expensive.

Clinton, Ia. CHARLES MARKEL.

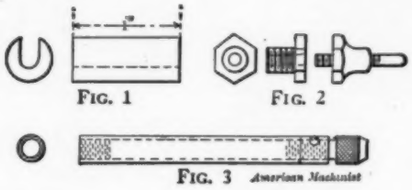
Improvements on Various Inside Micrometers

Before the very convenient notched-rod form of inside micrometer was obtainable it was sometimes a puzzling question how to remove an inside micrometer gage from a recess. A slotted sleeve, as shown in Fig. 1, was used in gaging some large internal threading of rather coarse pitch.

In this case the measuring points were of such a diameter as to contact at about one-half the depth of the thread, the thread tool being ground carefully to gage took care of the other dimensions when fed in till the inside micrometer reading was the same as in the sample. This gage was used to make duplicates of the sample, proved satisfactory and saved making an expensive plug gage.

In use the gage was inserted in the bore, the slotted sleeve put in place. After the proper touch was secured the sleeve was removed, allowing the gage to close 1 inch and to be removed.

An inside micrometer is very often more useful if both contact points are the

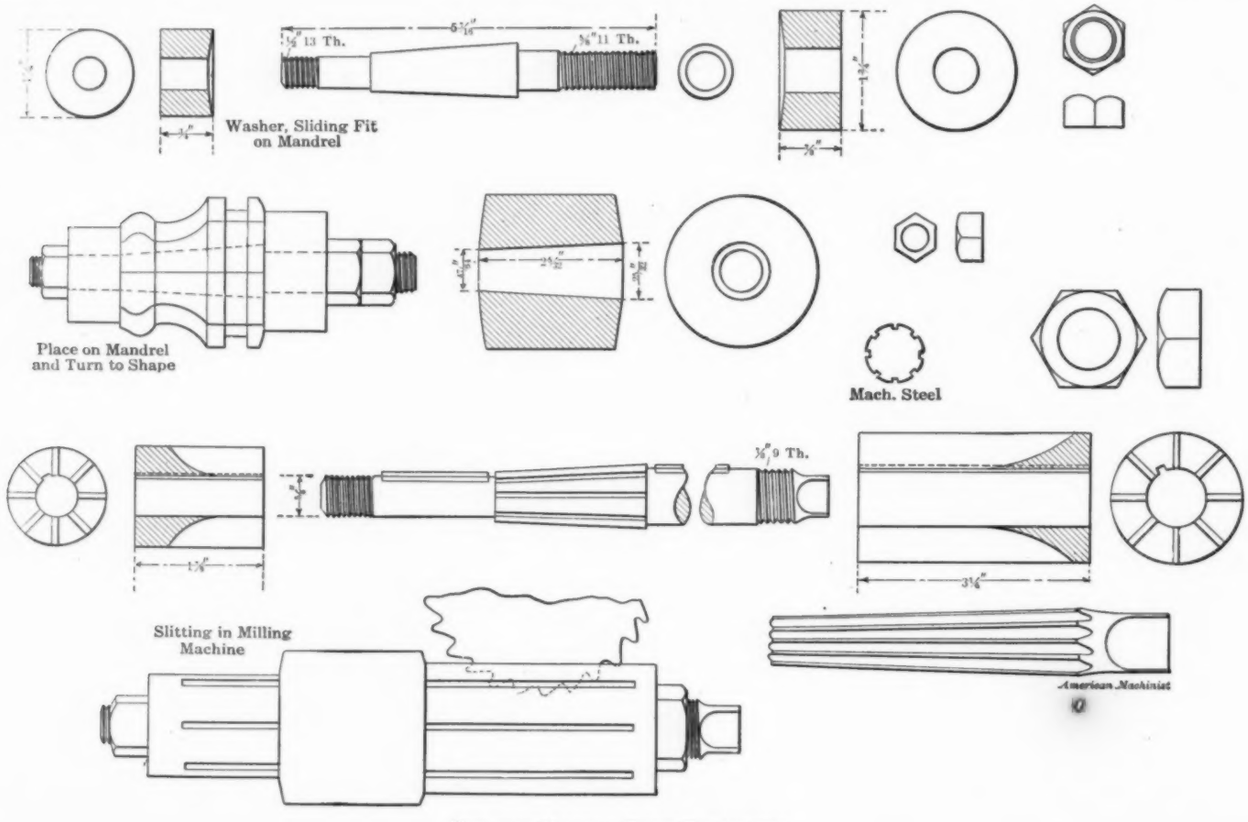


IMPROVEMENTS ON INSIDE MICROMETERS

same size for an inch or two. The relatively large diameter of the head often interferes with its use. To overcome this in the case of a well known inside micrometer the head contact point was unscrewed and one as shown in Fig. 2, was used.

An inside micrometer was changed, by adding one part, to nearly double its original capacity and it would still go in the original case. It was of the well known notched-rod design and the added piece was a piece of steel tubing arranged to screw onto the head by removing the chuck nut. It was provided with a chuck carrying the rods that belonged to the set and with means of adjusting to zero. See Fig. 3.

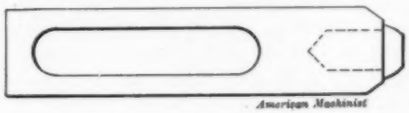
Morton Park, Ill. WM. S. ROWELL.


Washer, Sliding Fit on Mandrel
Place on Mandrel and Turn to Shape
Mach. Steel
Slitting in Milling Machine
American Machinist

JIGS FOR MAKING FLUE EXPANDERS

Babbitt in the Ends of Steady Rest Jaws

In using the steady rest in lathe work I have always had a lot of trouble with the jaws cutting into and marring the work, especially on brass work. I tried fiber, rawhide and other materials with little or no success, as they all wear away in a very short time, so finally I



STEADY REST JAW

tried drilling out the ends of the jaws and filling with babbitt as shown, which works to perfection.

Sewickley, Penn. T. M. KRAMER.

Points for Lo Swing Lathe Users

When turning up some pinions on the "Lo Swing" the second cut accidentally ran into the shoulder left by the first cut, breaking the point off the head center so that it was too short to repoint.

In making a new one it was decided to make it so that if the accident occurred again, a standard and cheaper center could be used. Fig. 1 shows the original center and Fig. 2 the new design. To make the change the old center was annealed, bored for No. 4 Morse taper, hardened, and the hole lapped and the outside ground.

By reaming the taper hole shallower than the hole in the tailstock, centers worn too short there can be used in the head center. The self-adjusting driving bar was also bored to allow it to rock around the center which goes directly through it.

THE CUTTING TOOLS

The shape of the point of the cutting tools was taken up and settled in a satisfactory manner.

Our first plan was to grind the tools like Fig. 3. This shape point cut well but was short lived, for in sharpening it soon got below the center line. Then the tool had to be reground and this used up from one-half to three-quarters of an inch of steel. This soon used up the tool.

In making a new batch of tools, a new shape of point, Fig. 4, was tried and proved to be good.

New tools are made 5¼ inches long, as when ground shorter than 3 inches they are hard to get into the tool block. Tools worn down to this length are returned to the tool room and rehardened and fitted to the extension shown in Fig. 5. They can then be used until they are ground down to about 1½ inches long and they are just as easily put into the tool blocks as the new tools.

The point or end of the tool-adjusting screw had a groove milled into it to clean out the chips.

Dayton, O. T. H. GRAY.

An Adjustable Spacing Collar for Milling Machine

We have an old slab-milling machine which we use for milling keyways in shafting. This old slab miller has no side adjustment at all as can be seen from the cut, Fig. 1.

Every day, and sometimes several times a day, we change the sizes of the shafting we want keyseated and, as the chuck in which we hold the steel is stationary and is bolted to the table, it is very evident that the collars between the shoulder of the arbor and the milling cutters would have to be changed for every different size shaft to be keyseated. The way we eased ourselves over that difficulty can be seen in Figs. 1 and 2.

These collars can be made any length; we make ours about 4 inches long over all.

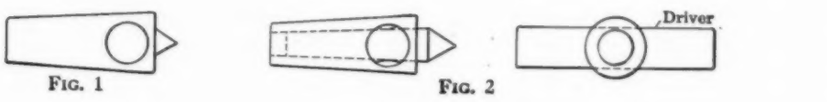


FIG. 1 FIG. 2

FIG. 3 FIG. 4

FIG. 5 Tool and Extension

LO SWING LATHE POINTS

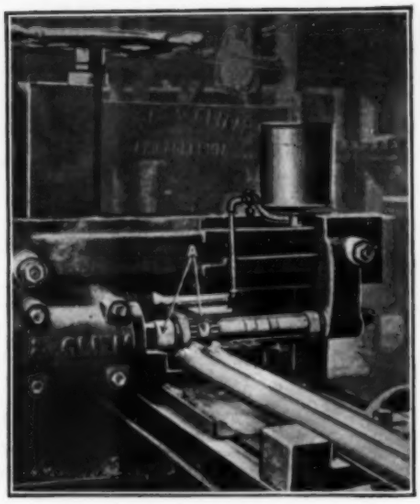


FIG. 1. THE COLLAR IN USE

By putting one on between the shoulder of the arbor and the first cutter and one between the cutters, it is a great saving of time. We made the collars of cold-rolled steel, and a nice snug fit just so you could screw them together or apart

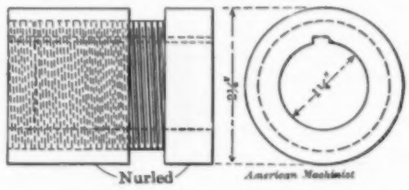


FIG. 2. SECTIONAL VIEW OF THE ADJUSTABLE COLLAR

as the case might be, with your fingers. We nurled the shell and the main body to simplify the movement. By loosening the nut on the end of the arbor it is a very short job to arrange your cutters where you want them. This arrangement is very simple and saves time.

Salem, O. ARTHUR HARWOOD.

Fountain Pen for Inking Tracings

In these days when everything is on the move, including the "cost of living," it behooves even the draftsman to devise methods of making haste.

For the quick inking of tracings, I wish to put in a bid for the humble fountain pen. In my work I use this instrument only, and find it much more rapid than the regular inking pen.

After all is said, pretty drawings are not as important as clear sketches, correctly dimensioned, and the fountain pen is first rate for this. The ink used is Higgins Eternal, which flows easier than the regular drawing ink.

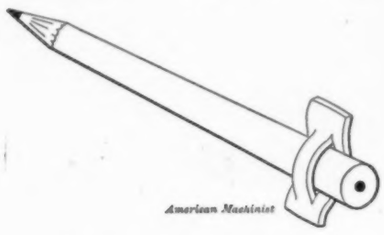
It is superfluous to add that the pens must be kept full and cleaned frequently.

Springfield, Mass. B. E. WINSLOW.

Anti-Rolling Pencil Kink

Although a constant reader of the AMERICAN MACHINIST, I have never seen published any ideas to keep a lead pencil from rolling off the desk or drawing board.

I, being a draftsman, use from three to four pencils on my board continually and our boards are on an incline as most of them are. It keeps us busy all day grabbing our pencils as they come rolling



ANTI-SKID DEVICE FOR PENCIL

down the board, so I thought of putting a piece of felt on the end of the pencil.

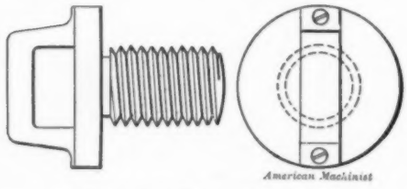
As belt lacing is very plentiful in the factory, I got a piece, cut a loop in it and pushed it over the end as shown in the sketch and I have no more trouble with my pencils.

I think this is a "kink" the boys would like to know of.

Bridgeport, Conn. JOSEPH WALSH.

Keeping Dirt Out of Chuck Threads

The line cut shows a threaded hard-



A PLUG FOR CHUCK THREADS

wood plug which I use to keep the threads clean when the chuck is not in use on the lathe.

Croyden, Eng. W. J. BILTON.

Jig for Drilling Balls

The ball to be drilled rests on *C*, provided with a hole larger than that to be drilled. The ball is held in position by the set screw *B*, the lower end of which, as well as the upper end of *C*, has a spherical surface. The drill is guided by a bushing *D* and will go exactly through the center of the ball, on account of the spherical surfaces *B* and *C*.

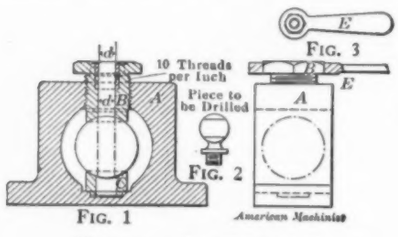
For the convenience of the drill-press hand a wrench, as shown in Fig. 3, may be fixed on the head of set screw *B*.

Fig. 2 shows the work.

W. METZELBURG.

East Pittsburg, Penn.

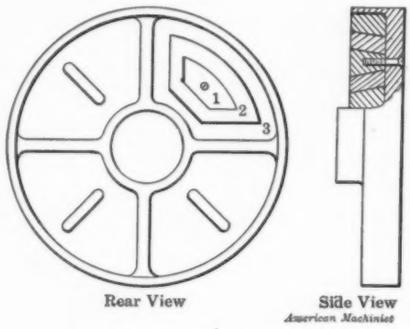
[The faces of *B* and *C* need not be spherical. They may be conical or even left flat. The hole will center the ball till the drill is centered and after that the drill will hold the work central.—ED.]



DRILLING JIG FOR BALLS

Faceplate Counterbalance

The usual method is to bolt some piece of iron or steel upon the opposite side of faceplate. This method is all right, but in a great many cases the junk we have to bolt on the faceplate in order to even up sticks out too far and is usually in the



FACEPLATE COUNTERBALANCE

way so much as to interfere with the tool, etc. I, therefore, suggest having some iron plates made that will fit into one another as shown in the cut. They may be made hollow and filled with lead or else cast solid.

These plates should be made so that the large one fits in the quarter space in the back of the faceplate and the next size made to fit into the large one and so on down. Three of them would be all right and can be put on according to the weight of the job. The center one must be tapped out to bolt it to the faceplate. Only one needs to be tapped as the small one holds the next size and the next size holds the next and so on. This scheme would leave the front of the faceplate clear for the job.

Waterloo, Ia. CHAS. HOMEWOOD.

A Taper Tap

The accompanying cut shows a tap for taper tapping a hole at both ends by sending the tap straight through, instead of taper tapping from either end separately, as is usually done.

The tap, of course, is more practical for large holes, but it has worked successfully on 1-inch holes, where the thread is fine, and a slight taper is required. *A* is a hardened mandrel carefully fitted through the hole in the center of the tap. The tool-steel chasers *B* are also carefully fitted in the slots provided for them. The straight portion at *C* is provided to permit the chasers to pass the center before starting to taper the opposite way. *D* is a stud, slightly smaller in diameter than the mandrel, made fast to the machine table and is intended for the mandrel to rest against while the tap is in motion. In using the tap the work is clamped in position, providing sufficient clearance for the tap to pass clear through. The tap is then put in place, with the mandrel resting on the stud *D*. It will be noticed that as the tap travels downward on the mandrel it will produce the same taper in the work as is on the mandrel.

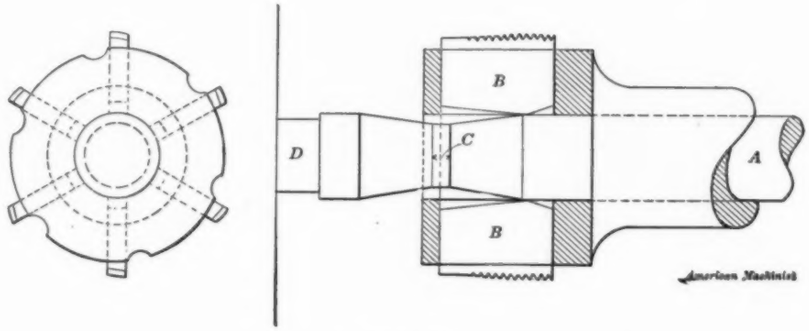
It is my intention only to convey the idea to your readers, no device being shown for preventing the chasers from falling out; there are, however, several methods which will answer for this.

The tap is shown as it will appear just prior to entering the hole.

WILLIAM HEIL.

West Orange, N. J.

Rust may be removed from iron or steel utensils in many ways. If recent, rub with an oil-soaked cork; or with very fine emery and a little oil, or with strong alum and vinegar, or soak in turpentine or kerosene over night and clean with very fine emery cloth.



A TAPER TAP

Discussion of Previous Question

Letters from our readers showing how many men of many minds look upon various subjects opened up in previous numbers

Repairing Rod Bushings

First true up the hole with the internal grinder, leaving the bushing in its place, or if the case-hardening has been worn away, drive out the bushing and reharden it, replace and regrind just sufficient to true up the hole. In the meantime the pin, which will also have become worn, should be softened, put in the lathe and a hole bored through it.

Assuming the original diameter of the pin was 1½ inches a ⅝-inch hole should be bored through, and each end beveled to receive lathe center, about 1/16 inch face on the bevel will do. The pin should then be heated and a drift driven through to expand the hole. This swells the pin, the size of the drift being sufficient to allow for regrinding the pin after case-hardening to fit the reground bushing. One drift is usually enough, although if as much as 1/16 inch or even 3/32 inch expansion on the pin may be required to allow for regrinding, consequently two or more drifts may be necessary. After

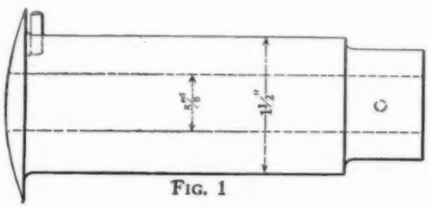


FIG. 1

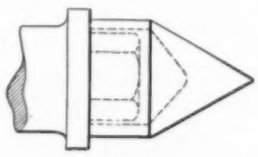


FIG. 2 *American Machinist*

METHOD OF REPAIRING ROD BUSHINGS

case-hardening the pin is centered by means of a grinding center, Fig. 2, in case the expansion has not been true. The grinding center contains a core of lead in which is imbedded a nut, to screw on a screwed shank, of a piece of mild steel turned to fit center hole in spindle.

The pin is then placed between the centers of the external grinding machine and ground to fit the bushing and rod. This method may entail more expense in the beginning, but results prove that the life of this repair is equal to, and in some cases more than, the original job.

Liverpool, England. D. H. V.

Finding Angles in Machines

I read the article on the above subject by James F. Hobart, the other day. I had occasion to obtain various angles on a certain machine (for the purpose of transferring them on paper), just before I read it. On that account the article was of special interest, and caused me not a little surprise. The method he explained is, to say the least, very clumsy. He says, "all the tools required are a surface plate, or a level foundation for placing the machine upon, and an adjustable try square." The machine I was measuring weighs about 3 tons. I want to know if he intends me to lift this machine upon a surface plate for the sake of getting the inclination of a spring or lever that is on the machine. After he has placed his machine upon the surface plate, he then proceeds to get his angles. To do this he uses an adjustable square, and by its aid he obtains two distances at right angles to each other. He does this by adjusting the blade until the bubble in the level is central. After all this trouble he has obtained two sides of a triangle and the included angle, which is 90 degrees. What he is trying to get at is the angle that the third side makes with either of the other two. He now has the pleasure of solving a triangle having given two sides and the included angle. With the aid of his slide rule he manages to get at the tangent of the required angle, and on looking up the list of natural tangents finds out at what angle his lever is inclined.

Instead of the adjustable try square fitted with its level, I used a protractor with level fitted, viz., one from a Starrett's combination set. First of all I tested a surface which ought to be level and which would be represented on my drawing by a horizontal line. In this instance it was correct, so that all I had to do was, place the protractor on the surface whose inclination I wanted. Then I turned the graduated ring round until the bubble in the level was central. From the protractor I read the angle and there I got what I wanted. No calculations, no slide rules, no table of tangents. One can always find a surface, or shaft to work from as a base. The angle of this is first obtained and when the other readings are taken this angle is subtracted or added as the case may be. It is not likely that it will be many degrees wrong, and if it is, it makes no difference to the final result. A lot of time can be wasted making measurements of machines, and the method of your correspondent will not mend matters in this respect.

Padiham, Eng. JOHN ROLLINSON.

Loyalty

Your interesting editorial "Loyalty" would have been more complete and inspiring had it dealt with the relation of employee and employer on the basis of equality. In the above article you say: "On the other hand, an employer owes a degree of loyalty to his help." Loyalty cannot be measured by degrees any more than honesty. It is self-evident that the phrase "99 per cent. honest" is absurd. If this sentence of your article means that the employer need not extend to his employees the same "degree" of loyalty that he expects from them it is obviously wrong. When the employer recognizes the importance of a good example he will be rewarded manifold. After all, "to get along with one another is the problem of today," and we all should cultivate a desire to get along not only with members of our family, friends or business associates, but our workingmen as well. For some reason or other employers have cultivated a belief that workingmen are a necessary evil, instead of dividend earners. Workingmen do many foolish things, employers likewise. When both parties realize their dependence one upon the other, loyalty will be established; not a degree, but *loyalty*.

Hartford, Conn. W. F. HELMOND.

The Cadillac Thread

I was much interested in the article by A. D. Elmer, on page 211, as it is a good thread. I know, because I used it 25 years ago. But it was not new then, as I'm told that John J. Grant invented, designed or discovered it several years before that, and I copied it from him. Don't know whom he copied it from; maybe he dug it out of his head as he has so many other good things.

I hope many will read and profit by the article, as it is a good form of thread, no matter what name it bears. But it shows how much time we waste in reinventing things which should have been known to all.

New York City. JOHN R. GODFREY.

Confessions of a Toolmaker

When I read the "Confessions of a College Professor," by Entropy, my first thought was that I would like that sort of a job—or is it a position? Further reflection does not seem to diminish the desire much.

The second thought was, that if the allegory written by Entropy was only even an overdrawn joke—with as the editor suggested, a few grains of truth thrown in, for seasoning—how some machine-shop foreman, superintendent or manager could make him turn green with envy; if he would merely write some of the true happenings of the machine business, where "truth is stranger than fiction"—and scarcer.

This last desire has been gratified by Mr. Faust's letter on page 1075, Volume 33, Part 2. He didn't exactly offer it as a confession but that is one of the ways the average toolmaker is bound to see it.

In the first place he gets $10,000 a year for being worth it. That must be nice. Then he gives instances of salaries that other men get that are an eye-opener to most of us. We eastern toolmakers have little knowledge of such things and few of us knew that any but a "captain of industry" could "command" such a salary.

His $10,000 a year—almost $200 a week makes Entropy's 18 times two dollars a week look shabby, especially after he owns up that *he* didn't know the "facts (and also principles)" with which he had filled his mind, well enough to successfully teach them.

If a college professor *"confesses"* that he takes $2000 a year for work which he has qualified for only by years of study, what should a man do who takes $10,000 a year for work the qualifications for which are possessed by perhaps every tenth man one meets?

He seems to have carefully avoided details and that compels us to draw conclusions based on our own experience, observation and imagination. Our experience is that the men who hold these high-salaried positions *are only men.* They try, almost invariably, to impress on whomever they hire, that advancement depends on merit only, in *their* establishment; that as soon as one is worth it he will get a raise. And about the only way to get a raise is to threaten to leave. We have observed that they seldom know much about shop work or shop men. Rarely are they men who ever did or could earn journeymen's wages at the trade.

Merit

We imagine that if Mr. Faust had had experience with various concerns here in the East, instead of only two which we infer are in the West, he would be less positive about the certainty with which high-salaried jobs *always* come to men who are competent to fill them.

What we think of the actual competence of a man who jumps from "T-square and cube root" to $450 a month in a single year is not complimentary. We have seen men do such stunts and, knowing the small change in perceptible merit "before and after," we incline to the opinion that such a man possesses two kinds of merit; namely, real and imaginary, and that the increase in pay is largely for the latter variety.

"Success in engineering . . . depends on merit alone."

Perhaps a great deal of the difference in our viewpoint hinges on the definition of the word merit. To the toolmaker and machinist merit includes character, judgment, and common sense, knowledge of shop methods and men, inventive ability, knowledge of correct theory and ability to make practice fit theory—ability to make the most profit possible on whatever is to be done.

Now it is the experience of many men that the employer seems to consider it a "merit" for a man to be single; if married and working in a small town it is a "merit" not to move his family into town; if he moves his family into town and buys a home he'll generally find it quite difficult to get a raise. Frequently to belong to the same club and drink at the same bar with the boss results in "advancement." To be a relative or friend of an officer or stockholder in the company or a son-in-law to somebody in authority are A1 "qualifications."

Mr. Faust speaks of a case where a man will soon get $10,000 more a year "because the old engineer is pretty near dead now." Will the old man's knowledge drop like a mantle on the younger man's shoulders and will he suddenly know more, $10,000 worth more a year? Why not, if success depends only on merit?

Legitimate (?) Profit

"The salary paid pretty nearly represents the worth of such service *minus the legitimate profit* to the employer."

There is a good sized manufacturing company here in the East which employs perhaps more than 50,000 men. Last year it is said that the average salary was about $500 per man. The company's profit averaged some $600 per man.

This differs from the rest of them in degree rather than principle.

Mr. Faust may object that this is not the class of employer he writes about, but he'll have to admit that the employers are the same, and if these same employers pay for merit more honestly in the higher positions in the engineering world than they do in the lower grades we would like to be shown.

A Common Experience

I believe my experience and the views thereof are not unusual or unnatural. I believe my opinions are concurred in by a great majority of the toolmakers and machinists of the country. Many men grumble and feel sore. I have passed that stage. I can stand it if the other fellow can. The employer is the bigger loser.

I confess that I am still ready as ever to "gear in" for anything that looks like opportunity; only nowadays I believe that; "Blessed are they who don't expect anything, for they won't be disappointed."

I allow for these conditions just the same as I allow for the spring of the arbor when trying to make something dead to size on a milling machine.

I believe, however, that too much labor is bought—and sold too—on a "hock shop" basis; that buying labor that way is even less satisfactory than buying overcoats in like manner.

All of which may be taken as a confession of the state of ignorance in which a toolmaker finds himself after having had 30 "jobs" in seven years.

Durham, N. H. J. C. T.

Gas Engines Require Skilled Attendants

I have had ten years' experience in the care and maintenance of gas engines on natural and producer gas. I have also had twenty-five years experience as a steam engineer, so feel that I am qualified to express an opinion on the subject. And it is my experience that it takes a higher order of skill to successfully operate a gas engine than a steam engine.

A successful gas engineer must be one who will not be satisfied until be thoroughly understands the fundamental principles underlying the design and operation of the engine. It has been my experience that the average steam engineer has a dislike for, or is afraid of, the gas engine. When such is the case, it is hardly to be expected that the engine will be able to give a good account of itself.

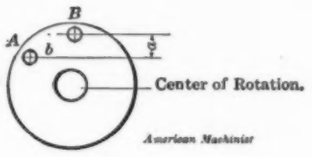
I have found the gas engine practically as reliable as the steam engine, if of good design and workmanship, with a skilled attendant who will keep it in order. The cost of maintenance of the internal-combustion engine is generally higher on account of the severe conditions as to temperature and pressure under which it works; also, faulty design has much to do with this, some of the old engines being much too light for the pressure. Think of shooting a 13-inch cannon one hundred times a minute at a 2¼x3-inch overhung crank pin, the explosion pressure running as high as 275 pounds. The most skilled mechanics could not fit a pin that would stay tight under these conditions.

Anderson, Ind. J. O. Benefiel.

Graduating a Scale on a Milling Machine

Edward J. Rantsch, in his description of a method for graduating a scale on the milling machine (page 1114, Volume 33, Part 2) is very insistent that the back stop pin be used and not the crank handle. I think that Mr. Rantsch would obtain better results if he used the crank handle and not the back stop pin.

All that are familiar with the dividing head shown by the line drawing in Mr. Rantsch's article, know that the back-stop pin works on an eccentric. This being so, what would happen if the index plate "ran out," as many of them do? One hole on the plate would be further



THE BACK STOP PIN

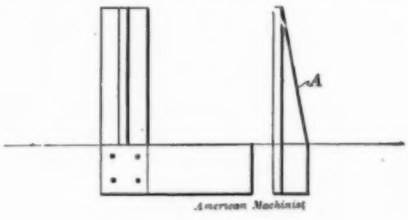
from the back stop pin than the hole opposite. Then, in order to get the pin into that hole, it would have to be moved up or down (as the case might be) and, in doing so, would move backward or forward, thus giving a difference in the advance of the plate. This can be seen more clearly by referring to the accompanying sketch of the back stop pin. In order to move up distance *a*, from *A* to *B*, an advance of *b* is made.

This discrepancy does not come in when using the crank handle, as it has the same center as the index plate and, if the back lash is taken up before starting the graduating operation, I see no excuse for an error.

Brooklyn, N. Y. G. W. A.

Nonmagnetic Square

On page 1027 of Volume 33, Part 2, there was shown an interesting magnetic square for drawing purposes and it suggests the description of a nonmagnetic square that I have used for a long time,



NONMAGNETIC TRY SQUARE

finding it very convenient for setting up work on a magnetic chuck, on planers and grinders. It is shown in the accompanying sketch.

This square is made from a brass bar, with a piece of hard or spring brass for the blade, and a bracket shown soldered in at *A* gives additional firmness.

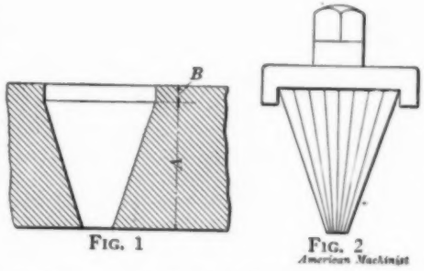
It is surprising how long one of these squares will last without truing up. A toolmaker does not like to use a steel square on a magnetic chuck, as he cannot get a "feeling" touch on account of the cling due to residual magnetism when the current is turned off, and it often is desirable to test a set-up when the current is on, or work in progress. For this purpose the nonmagnetic square is a great convenience.

Peterborough, Ont., Can. A. B. C.

A Self Gaging Piston Head Reamer

Under the above heading is an article by W. J. Shadle, on page 836, Volume 33, Part 2, in which he says that "the reamer can be ground and the size maintained by placing a tin shim between the reamer and the collar."

Mr. Shadle has probably had no occasion as yet to grind his reamer, and he will find that the ground reamer with the inserted shim will not finish the full length of the hole, but will leave a cylindrical part smaller than the desired maximum diameter, the length of which will equal the thickness of the shim.



SELF-GAGING PISTON-HEAD REAMER

In Fig. 1, *A* is the shaped portion formed by the reamer, while *B* is the part which will be cylindrical. It is not hard to see how this is, as the tin shim surely does not cut, and the hole will therefore be equal in its largest diameter only to the largest diameter of the reamer, after grinding.

Fig. 2 shows a form in which this reamer may be made, however, and do the work intended, by using a collar of the form shown, and grinding proportionately on the face *X* to maintain the form and size of the reamer.

The amount to be ground off the collar can be figured by the following formula in which *D* is the angle of taper, *A* the difference in diameter of reamer before and after grinding and *C* the amount to be ground from the collar, then

$$C = A \cot. D.$$

Philadelphia, Penn. J. H. HARRIS.

Automobile Speeds

The speed chart for automobiles on page 55 is excellent in its way, and will doubtlessly be appreciated by many. However, it has been my experience that such charts are never at hand when wanted; a simple formula that can be memorized is much better.

All of the problems solved by this chart may be reached by the use of a single constant; that is, 0.003, as follows:

M = Speed of car in miles per hour.
D = Diameter of wheels in inches.
R = Revolutions per minute.

$$M = 0.003\ D\ R.$$

$$D = \frac{M}{0.003\ R}.$$

$$R = \frac{M}{0.003\ D}.$$

The speed of the engine is, of course, $R \times$ gear reduction.

The constant 0.003 is found by the process of elimination, as follows:

$$M = \frac{\frac{D \times 3.1416}{12} \times R \times 60}{5280} = 0.00297,$$

which is so near the even figure 0.003, that the latter is much preferable.

Another handy constant is 88; used as follows: The speed of the car being given in miles per hour, to find the speed of the driving gear in feet per minute:

$$V = 88\ M \frac{d}{D}.$$

In which

V = Speed of the gear in feet per minute.
d = Pitch diameter of the gear in inches.

Also

$$V = d\ 0.2618\ R.$$

CHARLES H. LOGUE.

Pittsburg, Penn.

Shop Floors and Wrenches

Much has been said in your columns about shop floors, especially concrete, and one feature has not been given the prominence it deserves; that is, the undue wear to machinery caused by the dust ground from the concrete of the floor.

We are confident from our experience in a shop where there are thousands of square feet of this kind of floor, that this is an item not to be ignored. As to durability, the concrete will require about as much repairing as a wooden floor.

As regards your editorial on the abuse of tools, just remember that it is better, at times, for your employees to use a monkey wrench as a hammer than to let a lot of people stand idle while you go hunt up the real article. Also, it sometimes happens that you cannot get the wrench on a nut anyway except backward. Wrenches do not cost much, and

there are times when we are justified in abusing them. Of course, it gets on our nerves to see a husky workman put a wrench on a nut backward, when there is no occasion for it.

Indianapolis, Ind. J. O. B.

Estimates on Motor Building

Taking up the making of 25 per month first, I would make a holding or chucking jig for the boring operation, which would be done first. This jig should be made to fit the slots in the table of boring machine, at one end, to hold bolt flange and be fitted with set screws and lock nuts for centering and then locking the setting.

Cylinder should lie in the jig on its side; the jig split on the top as shown, Fig. 1. All machined parts of cylinder to be clear so the same jig can be used for milling faces, and as a jig to use on the drill press. The boring tool should be made of cheap tool steel, short and stiff as possible, with two cutters made of high-speed steel—cutters to be double ended and self-centering, but not floating.

For beveling the edge I would use a single-ended cutter. For facing I would use a milling cutter with steel body screwed on end of machine bar, with high-speed cutters held with taper pins on face of cutters. For drilling have jig arranged to receive an end plate with self-centering or expanding plug to set cylinder over and which by expanding in the bore would hold that end central. Hold the other end by set screws against some solid part of cylinder, say, near the inner head, to prevent distortion.

The jig bushings should be removable so tools for valve chambers and others can be inserted. Use a three-lip drill of the tapping size, and a boring bar for the seat and top face. Have a drill bushing threaded to fit the tapped hole, taper seat below to impinge on seat and center. Use seating tool with pilot reaching into reamed hole for finishing the seat. Use a counterboring tool for inlet and outlet connection, and spot facing bar for back facing friction and quick-change drill and tapping devices should be used for smaller holes.

Make the jig for centering on the grinding machine with a hollow plug to enter cylinder and bore of jig, then clamp and hold with a draw plug.

The Operations Suggested

The operations would be as follows: A Lucas horizontal boring machine on which jig containing cylinder would be placed. Take one roughing and one finishing cut and bevel the edge. Remove boring bar, screw on milling cutter and face flange. Turn the jig 90 degrees and mill flange. Turn again and mill other two flanges successively. Remove from jig and complete the lot in this operation.

For drilling insert in jig again with expanding plug in bore. Drill flange holes first, then other small holes, and tap, after which insert screws to hold rigidly for machining valve chambers.

In machining valve chamber use a three-lip drill through tap hole and face on top of seat. Just one or two turns of tool at slow speed to break scale, if any, and straighten edge. Run the seating tool in; also face outside around hole; then tap, after which insert threaded bushing and drill stem hole. For these operations use a 3-ft. radial drill.

As the last operation grind the bore. Remove bushing and ream. Finish the seat with a seating tool guided by pilot in reamed hole. Grind the bore. Counterbore and intake flanges. Time estimated as follows:

Boring and milling	90 minutes
Drilling and tapping smaller holes	30 minutes
Boring, tapping, seating, etc., valve chambers	90 minutes
Grinding	60 minutes
	270 minutes or 4.5 hours

Tools would cost about $300; boring machine about $1600; radial drill about $650; Heald grinding machine about $1000.

For making 25 cylinders per week, I would use the same tools for boring and milling as for previous program, only jig would have no drilling features. For drilling, seating and tapping, I would also use the same tools and would make another jig like one used for boring. Grinding machine would also be the same and the cost product not much lower.

Making 25 per Day

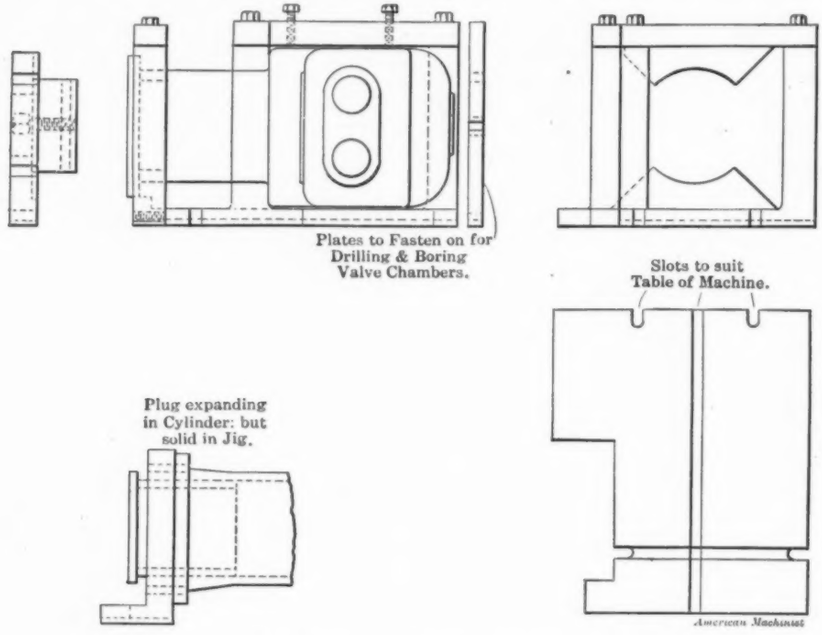
To machine 25 cylinders per day, I would get a special horizontal boring and milling machine, having one boring spindle for boring cylinder, one milling spindle for facing bolt flange, as well as two side spindles for facing exhaust and intake and water flanges, and for counterboring intake and exhaust flanges. For valve chambers I would have another spindle to use the same tools as in the first case. Another milling spindle would handle the flange on end of cylinder.

All spindles to have automatic trips and positive stops. Boring spindle, having automatic return and automatic feed change from fine to coarse, and *vice versa*.

Time for boring, milling and tapping	30 minutes
Time for drilling and tapping	30 minutes
Time for grinding about	60 minutes
	120 minutes

The cost of boring and milling machine would, I judge, be about $4000; other tools, perhaps $400.

Scottdale, Penn. M. B. Stauffer.


Plates to Fasten on for Drilling & Boring Valve Chambers.
Slots to suit Table of Machine.
Plug expanding in Cylinder: but solid in Jig.
American Machinist

Estimates on Motor Building

Suggestions for Lathe Bearing Dimensions

It has been suggested by a well known English designer of lathes that, as a general rule, the diameter of the front bearing should be one-quarter of the swing, as we count swing in America. This would make a 3-inch diameter bearing for a 12-inch swing lathe, and in a like manner a 7½-inch diameter bearing for a 30-inch swing.

These dimensions are suggested only for heavy, rapid-reduction lathes, and to allow for a good sized hole through the spindle.

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American Machinist

The Waste of Re-invention

In designing a mechanical device, or in planning a projected scientific investigation, everyone should be careful not to unnecessarily or unknowingly duplicate the previous work of others. It is very easy for anyone to do a great deal of such duplicating work without being aware of the fact, unless especial care is taken to avoid it. Re-invention and rediscovery are met with almost every day, each showing a real economic loss. Aside from this loss, this expenditure of fruitless work, it is disconcerting to develop a complicated design or carry to completion an arduous investigation and then find that some other person has done all of this before and perhaps done it much better owing to better facilities, greater skill, or a superior method of attack.

For these reasons it is wise to make use of all available channels of investigation prior to beginning work that may duplicate previous work of others. One aid to such an investigation along mechanical lines will be the National Museum of Art and Industry, the development of which we have mentioned in a recent article. When the record and history of all the important industrial arts are shown by means of models and illustrations, carefully arranged in proper sequence to show the progress from one stage to another, the careful investigator will be able to trace this progress with comparative ease, see the art as it exists today, and carry on his work from that point with a reasonable assurance that he is not duplicating previous work. This is one of the great functions of such a museum, and in this way it can be of tremendous service to the industries of the United States, a service that should be of incalculable value.

Pan American Trade

Those who seem to feel that we can expect very little European trade in the future, and are placing their hopes on South America, should read the recent opinion of Consul General Lay, at Rio de Janeiro, as expressed recently before the National Association of Manufacturers. Mr. Lay charges us with the almost absolute neglect of trade opportunities in Brazil and points out some of the steps necessary toward securing even a footing in that country.

As additional evidence, we have recently received a request from a subscriber in Buenos Aires, who is a contractor of engineering work, to have the English edition mailed him instead of the one published in the United States. This, he distinctly says, is because he desires the English advertisements, and is simply because he can buy English machines more easily than our own. This is for the reason that English manufacturers are much better represented in Buenos Aires and in South America in general than are our own, and, if we are looking toward South American trade in the future, it is high time we were laying some sort of a foundation at the present time.

While there is very little manufacturing in South America as yet, the trade in machines for repair shops is well worth looking after and will pave the way for the other when it comes.

We have faith to believe that the American manufacturer can find markets for his products at least as well as manufacturers of other nations, if he will display the same energy that he does in other directions. But it cannot be done by sitting in an office and expecting someone else to do it for him.

Preventing Fire Losses

We are too apt to overlook such causes of fires as are mentioned in a letter in another column. This calls attention to two specific cases of easily preventable fires in connection with manufacturing industries. That comparatively small damage was done in the cases cited was due to the accident of time rather than any good judgment or of means taken for their prevention.

There are hundreds of similar cases in which an ounce of prevention would be well worth taking, although the failure to do so is many times more from ignorance than desire or carelessness.

There is still much educating to be done along this line by the inspectors of the fire underwriters, and it would be extremely desirable if some method would be developed of impressing shop owners and employees with the necessity of exercising constant care and vigilance to prevent the accumulation of combustible materials.

A concerted action on the part of insurance companies to temporarily raise rates where violations of precautionary rules are found, might have the desired effect. The main objection to such a plan is the lapse of memory which is very apt to occur when the time comes for again lowering the rate, on compliance with the underwriters' rulings.

The main question, however, is one of education both for proprietors and employees, and there is little doubt that a reduction of our enormous fire loss could be made if a campaign of this kind were faithfully carried out.

Multiple Spindle Chucking Machine

A machine-shop superintendent, who has been very active in developing special machine tools, recently said: "I wonder why someone does not build a small automatic multiple-spindle chucking machine, a machine that would have the same place in finishing small castings and forgings that the multiple-spindle automatic screw machines have in finishing pieces from bar stock. I need several such machines, but thus far have failed to find anyone who is building them. There is one such machine built, but the sizes are far too large for the pieces that I wish to finish."

We are willing to pass this along as a suggestion, knowing that if the demand is sufficient the machine will be forthcoming. It would be directly in line with the trend of manufacturing for producing a large number of interchangeable pieces, as special machine tools are the final step in producing pieces in large quantities, of excellent quality, and for the lowest price.

Snagging in the Punch Press

Occasionally we see a common operation given a peculiarly ingenious adaptation that is well worth while and that deserves to be widely known. An example of this kind came to our notice in the use of a punch press for snagging small composition castings.

The castings were small pieces and were gated. The first operation, cutting them away from the branches, was done with an ordinary sprue cutter. For the second operation they were taken to a punch press and passed through a die that trimmed off the sprue and fins, leaving the casing neatly snagged and accurate to outline.

On some small pieces the operation was carried even further, and additional machining was done, involving punch-press work. This was true of a small gear blank, in which part of the contour was finished to shape at the same time that the casting was snagged.

New Publications

The Worker and the State. By Arthur D. Dean. 354 pages 5x7½ inches. Published by the Century Company. Price, $1.20, net.

This is the latest book on the problem which is becoming more and more important, and which seems to consider the question from many points of view. It traces briefly the relation between the worker and the State from the earlier times down to the present, and it discusses the educational significance of modern industry; women in the home and factory; education for the wasted years; trade school at early ages; trade unions and trade schools; coöperative systems of industrial training; factory schools; supplemental education in its relation to industry, and a general summing up of the nature of the problem, showing the work to be accomplished and containing suggestions as to the best methods of arriving at the proper solution.

Iron and Steel. (A Pocket Encyclopedia). By H. P. Tiemann. 354 4x7-in. pages with 43 illustrations. McGraw-Hill Book Company., New York and London. Price, $3.

That the need of technical dictionaries is constantly growing is both illustrated and met in its particular field by this combination of dictionary, encyclopedia and handbook, relating to the mining and metallurgy of iron and steel. In no industry, perhaps, is there such a mixture of scientific and colloquial, or mill terms, each class being appropriate and necessary. Definitions of both classes of terms are given, the definitions in many cases being expanded to considerable length and illustrated by engravings of the furnaces and other forms of apparatus under definition. The book has an introduction and hearty indorsement by Prof. Henry M. Howe, than which no better certification to its value could be given. The book is printed on thin paper and bound in flexible leather, suitable for carrying in the pocket.

The Science of Poetry and the Philosophy of Language. By Hudson Maxim. 270 pages, 6½x9½ inches, 16 illustrations. Published by Funk & Wagnalls Company, New York. Price $2.50.

While a study of poetry is a little out of our line, the science of language as a means of expressing ideas is very important. In this work Mr. Maxim endeavors to introduce exact methods and scientific rationality into both the writing and the appraisement of literary productions of different kinds. With this in view he searches for the underlying principles of literary differentiation. He picks out the causes behind the various phenomena of speech and its effect and uses this as a foundation for his study of the whole architecture of language, both of men and of animals.

He points out the difference between verse, poetry and prose and gives many striking examples of each to show how the arrangement of the words in a sentence has a much more striking effect in some cases than in others, though stating exactly the same facts in both instances. Whether we aspire to poetic hights or not, the faculty of expressing ideas in a striking manner is much to be desired by all who have thoughts to express or convictions to voice, and a study of this book cannot fail to be of service along these lines.

M. J. Hogan

Martin J. Hogan, president and treasurer of the Engine and Machinery Company, Canton, Ohio, died at his home in that city on February 11.

Mr. Hogan was born in Waterloo, N. Y., in 1855, and 35 years ago he moved to Canton, taking a position as a machinist with the Aultman company. In turn he served as foreman, master mechanic and at the time the business was discontinued he was general superintendent.

He then associated himself with the Engine and Machinery Company, and at the time of his death was president and treasurer of the company.

Personals

G. L. Thompson, for several years connected with the Garvin Machine Company, New York, has resigned to join the New York sales staff of Manning, Maxwell & Moore.

Charles F. Leonard has accepted the position of New York manager for Hanford & Barkley, of Rochester, N. Y., designers of special machinery. The New York office is at 220 Broadway.

E. F. Lake has opened an office at Avenue B and Forty-seventh street, Bayonne, N. J., for consultation in matters relating to foundry methods, heat treatment of steel and similar work.

L. F. Hussey, for two years publicity manager for the Wells Brothers Company, Greenfield, Mass., has resigned in order to become advertising manager of the Standard Tool Company, Cleveland, Ohio.

George Q. Palmer has been elected president of the Alberger Condenser Company and the Alberger Pump Company, to succeed Louis R. Alberger, recently deceased. Mr. Palmer was formerly vice-president.

Charles O. Church, who has been for some time superintendent of the Georgian Manufacturing Company, Binghamton, N. Y., has become president and secretary of the Westfield Foundry and Valve Company, Westfield, Mass.

A. L. Lovejoy has resigned as sales manager of the New York office of the Pratt & Whitney Company, in order to accept the management of the Chelsea division of the Flanders Manufacturing Company, with headquarters at Chelsea, Mich.

A. Hamilton Church, author of several books on shop economy, and for a number of years engaged in England in professional work in the improvement of administration methods in factories, and general efficiency work, has come to this country to take up a similar practice, and has become associated with C. H. Scovell & Co., Boston, Mass.

Mechanical Engineer and Accidents

Editorial Correspondence

An abstract of a paper and discussion presented before the February meeting of the A. S. M. E., dealing with the influence and part the mechanical engineering profession can play in the prevention of industrial accidents.

The February meeting of the American Society of Mechanical Engineers held in New York City, was devoted to the presentation and discussion of a paper by John Calder on The Mechanical Engineer and Prevention of Accidents.

The paper indicated the nature and incident of industrial injuries, their prevalence and high rate per unit of working population in the United States, and expressed the desire that is everywhere manifesting itself today for better conditions and safeguards for the industrial worker. The possibilities in the position of the mechanical engineer in regard to such accidents were stated in these words:

"The scientific study as a matter of course and the solution by the mechanical engineer of individual problems of safeguarding, supervision and instruction of employees as they arise in their daily routine, will do more than all other existing agencies to bring about satisfactory results."

Causes of Accidents

The causes of accidents Mr. Calder grouped under six headings; namely, ignorance, carelessness, unsuitable clothing, insufficient lighting, dirty and obstructed work places, defects of machinery and structures.

The mechanical engineer can contribute to the safe engineering of a plant along two lines: A, The efficient safeguarding which he may design as an integral part of the machine tools and other apparatus supplied by him for use in the art; B, The safeguarding which he may later devise and supply as a mechanical engineer or executive of plants using power apparatus and other equipment capable of effecting injury as installed, and which cannot be intelligently protected until all related apparatus is in position, and the operating conditions for employees fully apparent.

Mechanical Safeguards

The paper was illustrated by 52 line drawings, showing approved safety devices for many kinds of machinery and forming a very complete and practical example of what such safeguards should be. Similar devices have been illustrated in our columns during the past few years, and it is unnecessary to reproduce

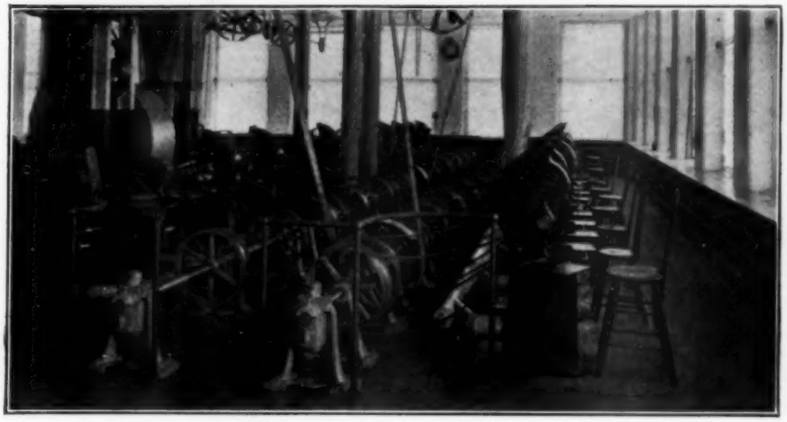


Fig. 1. Accident and Health Safeguards in a Polishing Room—Railings at Ends of the Floor Shafts and a Dust-exhausting System

Fig. 2. Gear Guard on Head of Lathe —Note, Also, the Rolled Up Sleeves of the Apprentices

Fig. 3. Guard Used to Cover Gears on a Gear-cutting Machine

Fig. 4. Pipe Counterweight Guards for Weights of Core-oven Doors

them here in detail. The reader is referred to the paper itself.

In conclusion emphasis was laid upon four points: Safeguards must be durable and easily identified from the parts of the machine or structure with which they are used. The author's practice has been to paint the body of such safeguards vermillion and the reinforced edges black.

Warning and caution notices should be sparingly used and in all cases made as brief as possible.

First aid for all accidents, whether major or trivial, is to be recommended because of the immediate relief to the patient and the preventing of later expensive medical treatment.

ber of interesting lantern slides of safety devices used in the Brown & Sharpe works at Providence. Six of these are reproduced in the accompanying illustrations. The captions are explanatory.

L. P. Alford pointed out that the milling machine is one of the dangerous machine-shop tools, as its toothed cutter can be compared, with the exception of its speed, with the circular saw. The records of one large machine shop showed that 13 per cent. of the serious accidents were from milling-machine cutters. Another point of danger is from falling objects. The same analysis showing that 24 per cent. of the serious accidents were from this cause alone. Attention was also called to the serious hazard in the

In making the body of the taps for these fittings it is customary in some shops to mill the cutter slots in the body of the tap, so that the center line of the slot is in a radial line, instead of having the front edge radial, as is sometimes done.

Front clearance, or what is really top rake, is always put on the cutters, the amount of this rake varying with the size of the tap, and with the kind of material being worked, but does not seem to have been reduced to any standard angle.

This rake is usually secured by first milling a groove of rounding section across the face of the blade or cutter near the teeth, and then filing with a half-round file from this groove to the

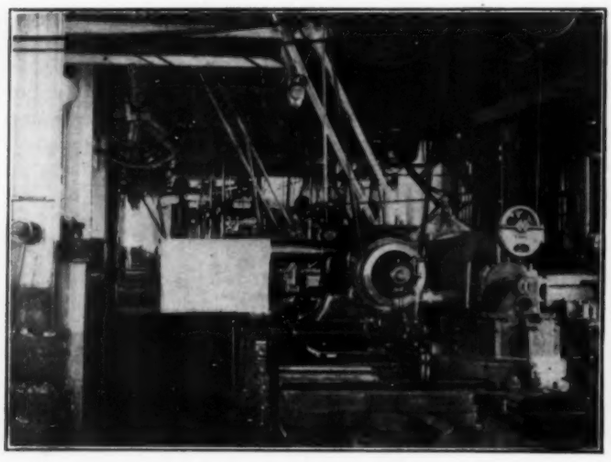


FIG. 5. A GUARD CONSISTING OF A SHEET OF PAPER HUNG ON A PART OF A MACHINE TOOL TEMPORARILY PROJECTING INTO A PASSAGEWAY

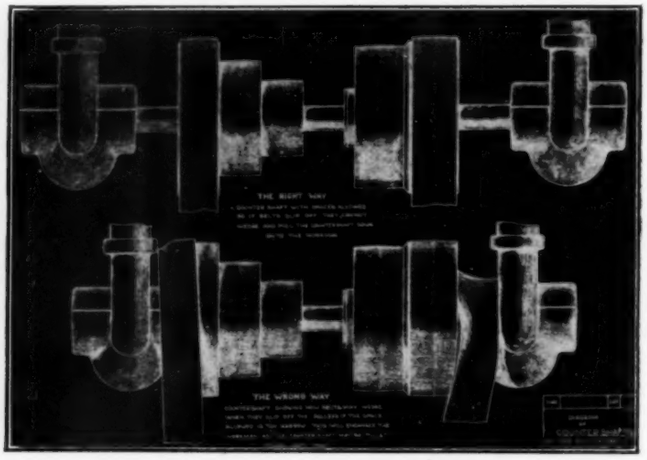


FIG. 6. A RIGHT AND WRONG WAY TO SPACE HANGERS AND PULLEYS ON COUNTERSHAFTS

And, lastly, accident registers furnish a valuable adjunct to the safety engineering of any plant. A periodical examination of them permits the mechanical engineer to practise safety engineering with an accurate knowledge of conditions and to the best of his ability.

DISCUSSIONS OF THE PAPER

Discussion was animated, but not controversial in character for all of the speakers expressed keen appreciation of Mr. Calder's paper, and congratulated the society on its presentation.

Professor Hutton, on behalf of the Museum of Safety, showed a number of lantern slides of safety devices, which form either in photograph or model a part of the museum's collection. He also extended a cordial invitation to the members at the meeting to visit the rooms of the museum in the Engineering building.

Mr. Cummings referred to the work done by the United States Steel Corporation in providing safeguards, and advocated the system which they use; that is, a shop safety committee to care for each plant.

Luther D. Burlingame showed a num-

use of oxy-hydric and oxy-acetylene cutting and fusing apparatus, and a suggestion made that some authoritative action be taken to prepare recommendations for the design, installation, care and use such apparatus, and establish a code of tests whereby its safety can be determined.

Magnus W. Alexander suggested that the society appoint a Committee of Safety of Working Conditions to study this subject in a broad way, to recommend mechanical safety devices, and aid in forming an intelligent public sentiment in regard to the entire subject of industrial accidents, their prevention and compensation.

The final discussion was prepared by Oberlin Smith and read in his absence. This dealt in a detailed way with guards for punching and pressing machinery and is of such interest that it will be published in a later issue.

Threading Well Casing

As well casings are comparatively thin for their diameter, it sometimes becomes quite a problem to thread them satisfactorily so that the thread shall be clean cut and not squeeze the pipe.

top of the teeth. This makes the exact shape, largely dependent on the experience of the man doing the work. It is quite probable that the whole of this clearance or rake could be successfully milled with a formed cutter, as far as the bottom of the teeth. The angle of rake on the teeth themselves can better be filed before hardening, or ground after hardening, than to attempt milling them on account of the bur that would be thrown in between the teeth and would have to be removed by filing or otherwise.

According to *The Engineer*, of London, the active life of a modern rifle is less than 4 seconds. In the case of the 13½-inch guns for the "Dreadnaughts," this is based upon 100 rounds before scoring the barrel to uselessness, 45 feet length of barrel and 1200 feet per second average speed of shot in the barrel. For sizes down to the 0.303, while more rounds are possible, the barrel is so much shorter as to make the total time about the same. We believe, however, that, like the policeman's "billy," the value of the big gun is in *scaring power* rather than actual destruction.

Shop Equipment News

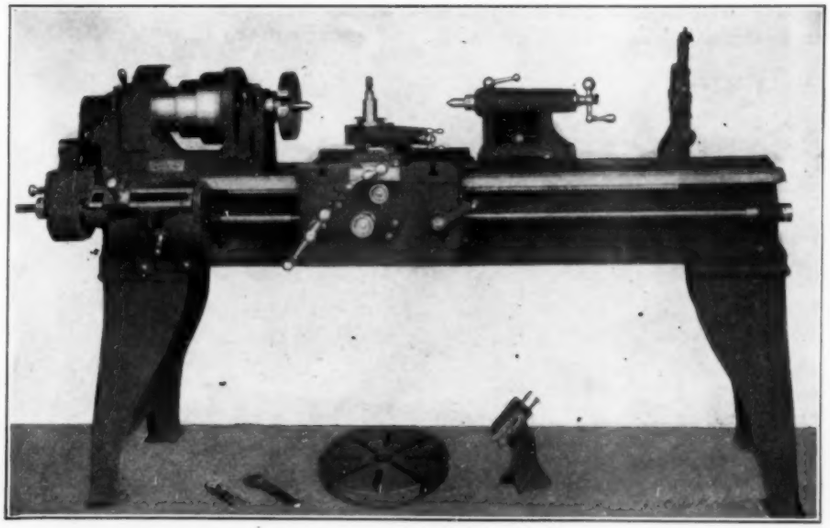
15-inch Double Back Gear Lathe with Quick Change Gear

The accompanying engraving illustrates the 15-inch lathe with double back gears and improved quick-change gear arrangement, made by the Carroll-Jamieson Machine Tool Company, Batavia, Ohio.

The machine is designed for handling efficiently an extensive line of work without loss of time in making changes, adjustments, etc. It is provided with a three-step cone for a 2½-inch belt and the double back gears are in the ratios of 8 to 1 and 3 to 1. The spindle runs in bronze boxes. The front bearing cap is provided with four screws and the head is secured to the bed by screws placed directly under the bearing to obviate vibration.

The gear mechanism in the feed box is so arranged that with the operation of one knob and one handle, 30 changes are obtainable for either turning or screw cutting in either direction, without the removal of a gear. The feeds range all the way up to 220 per inch. All feeds are friction controlled, and the rack pinion is provided with outer support.

The cross slide of the lathe is provided with bearing surfaces of ample area and is fitted with a taper gib. Power cross feed is provided and the cross-feed screw and compound rest screw are equipped with graduated collars. The carriage is gibbed front and rear so as to be rigid under the heaviest cuts. All gears are guarded in a substantial manner and much attention has been paid to details of design.



15-INCH DOUBLE-BACK GEAR LATHE WITH QUICK-CHANGE GEAR

ANY and all new or improved machines, tools or shop appliances of interest to men responsible for results in machinery-making plants will be briefly illustrated and described here — the machine shop news.
A more full and detailed description will be given — when it is real news — if it can appear here first — before it is sent to other papers. ALL descriptions appear in ALL four editions of the paper—Weekly, Monthly, Weekly English and Weekly German

Rapid Lamp Adjuster

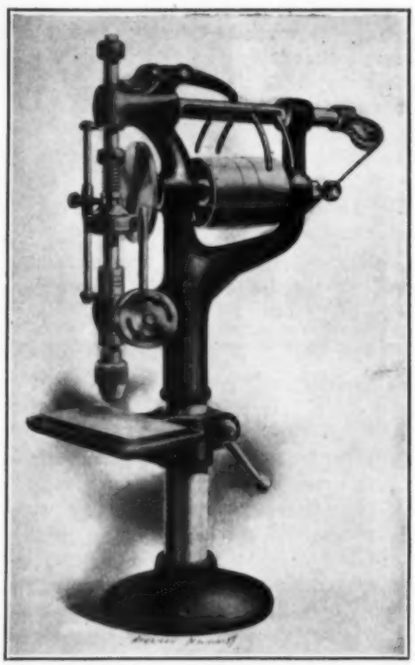
The Frantz Manufacturing Company, Sterling, Ill., is placing on the market what it calls its lightning lamp adjuster, which is a ceiling bracket designed to instantly adjust an electric drop light to any point desired. The bracket weighs less than four pounds and occupies no space that could otherwise be occupied. Three sizes are made, 6, 8 and 10 feet, the 6-foot length being suitable for a ceiling 12 feet or less in hight, and will adjust a lamp to any point desired within a radius of three feet horizontally and five feet perpendicularly.

A New Solder

This solder consists of a very finely pulverized solder, combined with a non-corrosive flux made into paste form, and put up in convenient collapsible tubes. It is made by the Solderall Company, 143 Liberty street, New York, N. Y.

A Bench Drilling and Tapping Machine

The cut shows a bench drilling and tapping machine built by Bourel & Vieira, Paris, France. The spindle is driven through a fricton disk from a set of two loose and one tight pulleys, carrying a crossed and an open belt. This gives valuable speeds and a reverse.



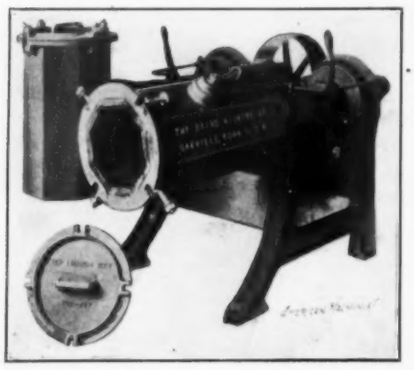
A FRENCH BENCH-DRILLING AND TAPPING MACHINE

In tapping a collar on the spindle trips, a latch holding a spring thus operating to reverse the machine when the tapping has reached the bottom of the hole. Raising the hand lever builds up the spring and sets everything in readiness for the next operation.

Improved Ball Burnishing Barrel

The accompanying illustration shows a double horizontal or steel-ball burnishing and buffing barrel.

When in operation the barrels are in a horizontal position, but for emptying or filling they may be easily tilted, as they are supported on trunnions near their center by heavy yokes secured to the



TILTING TUMBLING OR STEEL BALL-BURNISHING BARREL

driving shafts. The locking device which holds them in a horizontal position is simple and convenient; the method of holding the cover to which a gasket is secured effectually prevents leakage, requires very little time to operate and affords no loose parts to get lost. A pulley of ample size drives both barrels through bevel gears and friction clutches and the arrangement is such that either barrel may be operated entirely independent of the others.

This barrel is one of a line manufactured by the Baird Machine Company, Oakville, Conn.

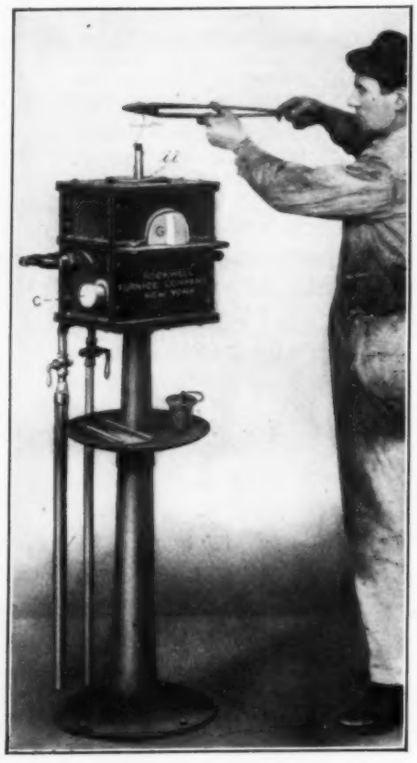
Combination Tool Room Furnace

The furnace shown in the accompanying illustration has been built for use in tool departments for heat treating a variety of small tools made from both high-speed and carbon steels, where accurate temperatures are required.

For end heating tools made of carbon steel, such as reamers, taps, lathe tools, etc., the entrance marked *C* is used. As an oven furnace for heating carbon-steel dies, such as dies, cutters, small chucks, etc., the entrance *G* is used. As a cylindrical furnace for hardening high-speed steel tools, the muffle and bottom tile are removed and reamers, drills, etc., up to 8 inches long, can be suspended in the heating chamber, as shown in operation in the illustration.

For lead hardening, the iron pot is placed in the entrance *i i*, the heat being evenly distributed over the body of the pot. Oil and sand tempering can likewise be accomplished.

The furnace is substantially constructed, made of cast iron throughout and



COMBINATION TOOL-ROOM FURNACE

lined with the best quality of fire tile. It is 3 ft. 10½ inches high, occupies a floor space of 16x16 inches and is manufactured by the Rockwell Furnace Company, New York City.

New Harrington Extension Lathe

This is a new size and a new design recently made by Edward Harrington Son & Co., Philadelphia, Penn., for high-speed duty. All general features of the regular Harrington extension lathes have been retained, and in addition, provision has been made for equipment of taper attachment, quick-change gear box and motor drive at any time if not ordered originally.

The top and bottom beds are both very wide, are securely braced and carefully fitted. Top bed is moved by a screw from the end, and is supported by bolts in T-slots and two jack screws. The headstock is substantial with triple gearing of wide range and ample power. Spindle is of forged high-carbon steel, bored hollow, and has extra-large bearings in phosphor-bronze boxes.

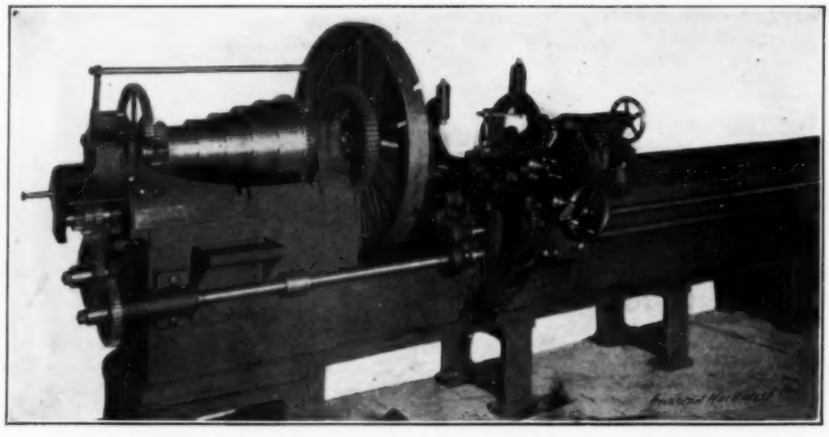
Feed and screw gears are provided to cut all regular threads and when equipped with ordinary swing yoke, three changes of feeds are obtained from the sliding-clutch pin. When equipped with quick-change gear box, all threads and feeds are obtained by one lever and the clutch pin.

Motor drive is provided by mounting the motor directly on the headstock to engage gears which replace the cone. Motor-speed control is governed by a hand wheel at the apron. Taper attachment is connected to the back of the carriage and does not need any special lugs cast on the bed.

This lathe has a swing over top shears of 16 inches; over lower guides, 32 inches, and over carriage, 11 inches.

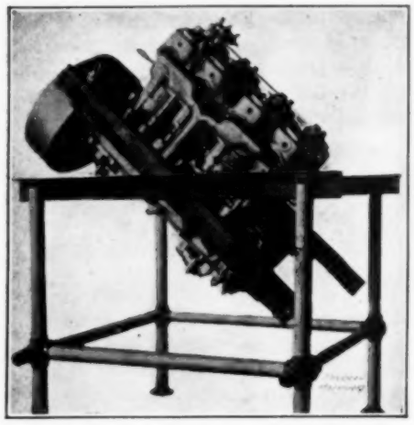
Adjustable Stand

The accompanying cut illustrates a stand designed to save time and give security and ease in handling machinery to be built or rebuilt, and is particularly adapted to this nature of work on automobile engines. The stand is adjustable for the varying widths of machinery, locking in any position, as well as containing a tilting and reversible table mounted therein, for the purpose of turning machinery in a reversed position without removal from the stand, locking the table in either positions. A motor can be fastened in place solidly, and after dismantling the parts on the upper half of engine such as cylinders, commu-



HARRINGTON 16-32 EXTENSION LATHE

tators, carbureters, water pumps and like parts, two locking pins can be disengaged and the engine turned over so that disassembling of the lower half of crank case, front cover over valve gears and flywheel can be accomplished. This stand is being built by the Standard Motor Car Company, of Scranton, Penn.



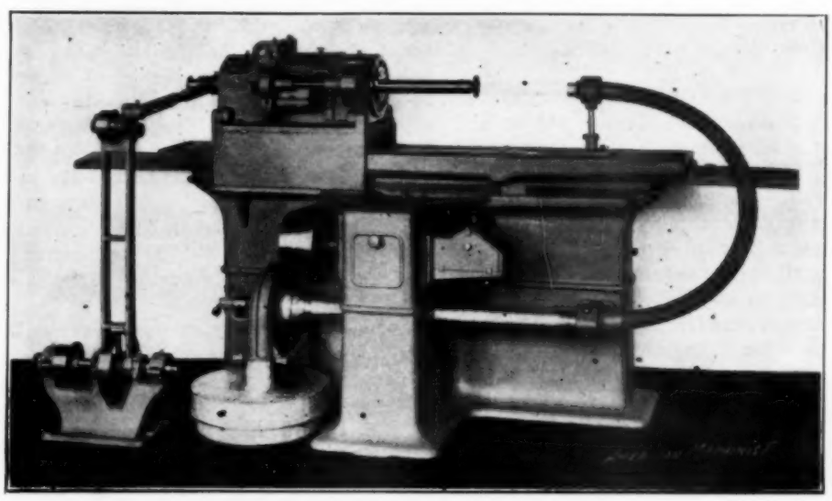
ADJUSTABLE SHOP STAND

New Cylinder Grinding Machine

The Brown & Sharpe Manufacturing Company, Providence, R. I., has redesigned its cylinder grinding machine as shown. In this type of machine the grinding spindle travels in a circular path so that the cylinder can remain stationary, a very desirable feature in grinding cylinders in which the weight is not uniformly distributed around a central axis.

The table travels under the head, which is thoroughly inclosed against dirt and also for the protection of the operator. The spindle is driven by a belt from the swinging floor stand which takes care of the rotary movement due to its travel. The grinder will handle cylinders up to 7-inch bore by 14 inches long.

A novel feature is the exhaust fan, hose and receiver which is part of the machine, making it independent of a general exhaust system and improving both the quality of the work and the health of the operator.



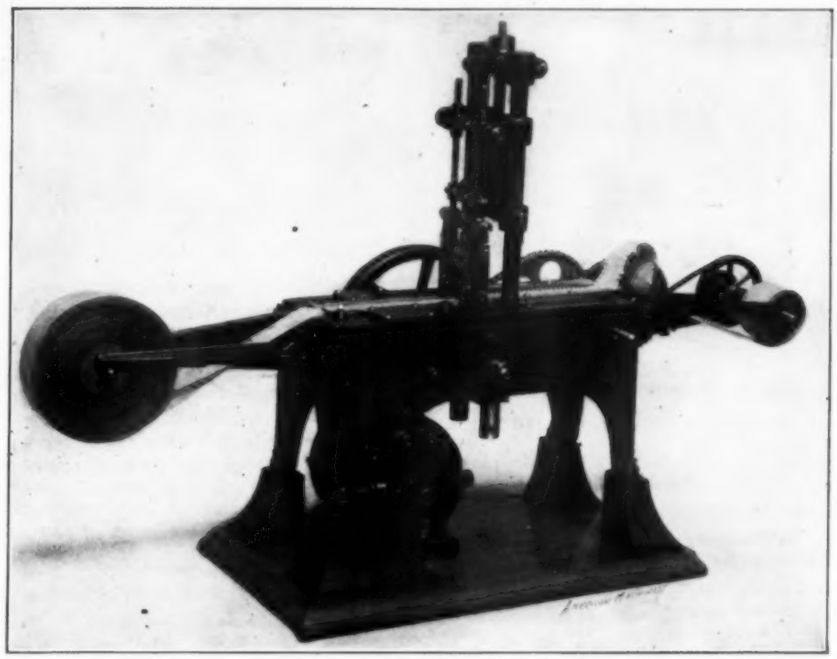
NEW BROWN & SHARPE CYLINDER GRINDER

A Perforating Machine

The halftone shows a machine invented and built by Chronik Brothers, 73 Gold street, New York. Primarily the machine is intended for perforating moving-picture films in which the spacing must be very accurate, but it is also adaptable to accurate spacing in sheet metal.

The punches and dies are movable lengthways of the machine, the amount of their travel being governed by suitable mechanism. The film is held in place by presser feet during the punching operation.

The operation is as follows: The end of the film is passed between the presser feet and the strippers and attached to the receiving reel at the right. The punches descend and perforate the film and at the moment of perforating, or immediately after, the presser feet are released. Further movement of the main shaft holds the punches and dies together with the film between them and these are carried forward a predetermined amount toward the receiving reel. At the moment when this movement ceases the presser feet are forced by springs into engagement with the film and hold it while the punches disengage and travel back to the punching position.

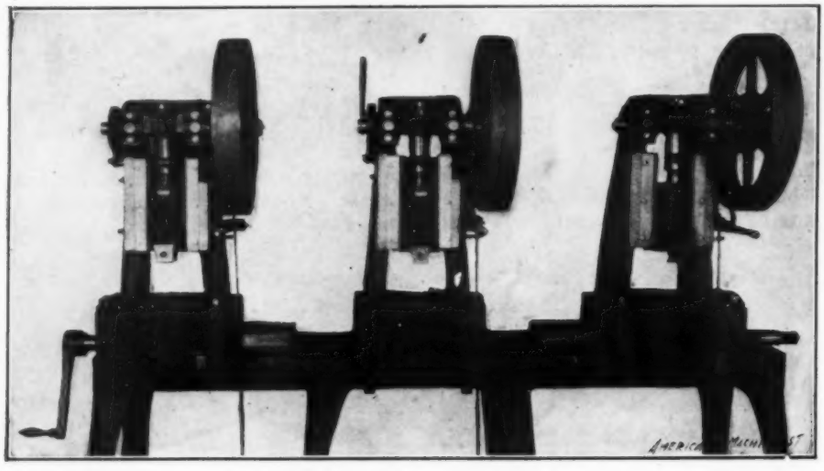


A PERFORATING MACHINE

A Multiple Piercing Press

The halftone shows a multiple press consisting of one stationary and two movable presses set on the same bed, built by the Standard Machine Co., Providence R. I. The purpose of the equipment is for piercing long pieces, having a separate press to do separate operations, also for piercing pieces of unusual length and impossible to handle in a gang piercing press. The presses on either end are moved by a square-thread screw and are dovetailed on the bottom part of the bed. The end machines are fitted with a gib and very powerful clamping screws on the back of the press for clamping. The overall length of the bed is 7 feet 6 inches. The stroke

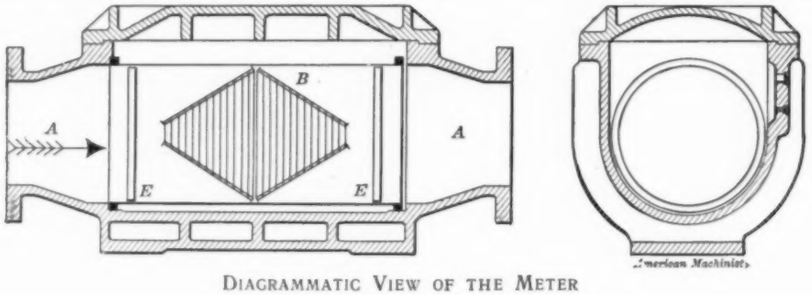
of each machine is 1½ inches; width of opening in back of frame 7 inches; adjustment 1⅞ inches. The bolster plate of each machine is 16 inches from right to left by 8½ inches from front to back. Each machine is fitted with instantaneous roller friction clutch and the total weight of the equipment is 6500 pounds.



A MULTIPLE PIERCING PRESS

An Air and Gas Meter

The illustration shows a diagrammatic view of the interior mechanism of the Thomas air and gas meter now being manufactured by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This device is for indicating, integrating, or graphically recording, the quantity of flow of gases, including air, at any pressure and at any temperature, independent of fluctuations of temperature or pressure.



DIAGRAMMATIC VIEW OF THE METER

The principle upon which this meter operates is the measurement of a given quantity of electric power required to heat the flowing gas or air through a definite range of temperature, which range is automatically and accurately maintained constant, independent of the quantity of the gas flowing.

Referring to the cut, *B* is an electric heater, formed of resistance wires carrying the electric current which is measured. At *E E* are two resistance screens or grids, composed of a special alloy of wire, whose electrical resistance, like that of other substances, is directly proportionate to its temperature. The gas flows through both grids and heater.

The two resistance grids are connected so as to constitute the two arms of a wheatstone bridge, or electrical balance, and by their variation in resistance with temperature change they control an electrical pointer, carrying a contact such that the quantity of electric current flowing through *B* is maintained just sufficient to raise the temperature of the flowing air two degrees higher at the discharge end of the meter, than it is at the inlet end. This temperature increase is always two degrees, independent of the initial temperature.

The quantity of electric current flowing through the heater *B* is measured by an ordinary wattmeter, and so is definitely known. From this, knowing also the specific heat of the flowing gas or air, and the constant temperature increase of two degrees, it is possible to determine the exact quantity of air or gas flowing. The electrical recording apparatus is so designed as to read directly in cubic feet at the standard temperature and pressure desired.

As the quantity of heat required to increase the temperature of the flowing material depends only upon the weight of the material and its specific heat, and not upon its pressure or absolute temperature, this apparatus is capable of recording the true quantity of flowing gas independent of either the pressure or the temperature.

A Machine Shop Reminiscence

BY TECUMSEH SWIFT

I read in the papers that Tompkins Market, at the upper end of the Bowery and just across the way from Cooper Institute in New York city, is to be torn down and that a building of modern type is to be erected upon the site as an annex of Cooper Union, whose magnificently beneficent work has outgrown its present accomodations.

The new building will no doubt be a fair representation of the age of steel, as the old building was of the age of cast iron. It happens that, in a way, I was in close touch with the building of the old market and know some things about it which few others now know.

The building is cast iron throughout, the shell being composed of castings as large and heavy as could be conveniently handled, and then there are heavy columns and other members composing the interior. With good hoisting facilities it should not be a difficult task to disintegrate the structure, or to "take it from together," as an old Yorkshireman who had to do with the beginning of it, would have said.

All of the iron work of the building, including the pattern making, the casting of the pieces, the fitting them to go totether accurately, and the erection of all was done by the firm of Starbuck Brothers, Troy, N. Y., then the biggest iron works in the State outside of New York City with the single exception of the West Point Foundry, at Cold Spring. The Starbuck Iron Works, on Centre Island at Troy, was very completely equipped for the time, comprising foundry, machine shop, blacksmith shop, boiler shop, pattern shop, and a separate woodworking shop, and the establishment as a whole turned out a great variety of work such as, in kind, it would take more than a dozen specialized shops now to produce.

The contract for the entire building was awarded to the above named firm about the time of the terrible panic of 1857, the work extending through 1858 and most of 1859. According to my experience, that panic was more severe and disastrous to all lines of business than any which have come since. There was such a sudden and sharp drop in prices, especially of labor, that the firm received an offer of $40,000 to transfer the contract to other parties before a stroke of work was done.

Some of the heavy castings went on to the big planer to have the flat bearing surfaces trued, but besides that there was very little machine work done on the job. The trimming of the end and side chipping-pieces, where the castings fitted together, was done with hammer and chisel and file and there was a lot of ratchet drilling and hand tapping, so that

the number of men employed on this job alone, besides the other work in hand, was quite large.

The castings, with the men working on them, were scattered all over the big yard space of the works. One piece was near the big door, and a casting on a horse-drawn truck, going to the planer, happened to hit it, when it fell over upon the man working on it and he died next day. This fatality probably did not get into the New York papers as an item in the history of the building.

The highest wages paid any machinist employed by the firm in 1858 and 1859 was $1.25 per day, and there were hundreds of men begging for work at that price. The machine-shop foreman got $2.50 per day—my father was the foreman. I was just beginning to call myself a machinist—I was never apprenticed—and I got nine shillings, $1.12½ a day. These wages were paid not only for the rough market work, but for the best steam-engine or other work of the shop.

Increasing Shop Capacities

METAL WORKING

NEW ENGLAND

News items for the sales department — where more equipment will be needed. Authentic news is solicited for this department, not rumors or gossip — facts

The Richard French Iron Company, Worcester, Mass., is to erect a new forge shop at its plant.

The Sayles Bleachery, Saylesville, R. I., will soon build a three-story machine shop.

The typewriter repair shop of W. D. Wilmot, Bank street, Providence, R. I., was badly damaged by fire.

The American Ax and Tool Company, East Douglas, Mass., contemplate removing its plant to Glasport, Penn.

The Ashaway (R. I.) Dyeing Company has leased the Bethel Mills, at that place, and will start business there.

C. W. Kelsey Company, Hartford, Conn., will make extensive additions to care for increasing automobile business.

The plant of the Brooks Manufacturing Company, manufacturing jewelers, Boston, Mass., was damaged by fire.

The Waldorf Motor and Machine Company has been incorporated at Bridgeport, Conn. Chas. E. Waldorf, president.

The Woonsocket Machine Company, Woonsocket, R. I., has placed contract for new machine shop and planer building.

C. H. Ballou & Co., manufacturing jewelers, Providence, R. I., are to remove their plant from Eddy street to Pine street.

The Everett Mills, Lawrence, Mass., has a list of machine tools out, including drills, lathes, planer, gear cutter, etc. Jas. L. Milliken will buy the equipment.

The Larabee Electrical Company has been capitalized at $10,000 at Portland, Me., to manufacture electrical supplies. H. Perkins, president; H. Larabee, treasurer.

The North Swansea (R. I.) Manufacturing Company, manufacturing jewelers, has been formed and will locate a plant in that town. Senator C. W. Greene, of Warren, R. I., is one of the promoters.

The Polleys Pneumatic Cylinder Company has been organized at Auburn, Me., with a capital of $1,000,000. The company proposes to manufacture automobile cylinders and other parts, also automobiles, etc. Chas. G. Polleys, of Malden, Mass., is president.

The Narragansett Chemical Company has been incorporated at Providence, R. I., to manufacture, import and export chemicals. Incorporators are L. S. Little, East Greenwich, R. I., and James D. Dean, Providence, R. I.

MIDDLE STATES

The Wise Furnace Company, Akron, Ohio, will erect a new plant.

The Union Steel Casting Company, Lawrenceville, Penn., will erect a plant.

The Watertown (S. D.) Plow Company has arranged for the erection of a plant.

The Grafton (Ill.) Stove and Heading Company will erect a plant at Pocahontas, Ark.

The Rome Wire Company has let the contract for an additional building at Rome, N. Y.

The Buffalo Bolt Company, North Tonawanda, N. Y., is to build a big addition to its plant.

Claus Buchholz, Hoboken, N. J., will build a foundry and machine shop on New York avenue.

The Foster Bolt and Nut Manufacturing Company, Cleveland, Ohio, will erect a new factory.

The New York, Ontario & Western Railroad will erect a machine shop at Middletown, N. Y.

The Davis Threshing Machine Company, of Oshkosh, Wis., will build a plant and employ about 100 mechanics.

The Economy Motor Car Company, of Joliet, Ill., is considering the erection of a plant at Delavan, Wis.

The Warren Motor Car Company, Detroit, Mich., will soon begin the erection of another factory building.

The Staver Carriage Company, of Chicago, Ill., is said to be contemplating the erection of a large automobile plant.

S. Freeman & Sons Company Manufacturing Company, Racine, Wis., is contemplating an addition to its foundry.

The Ziegler-Schryer Manufacturing Company, Freeport, Ill., building gasolene engines, will erect a new machine shop.

The Rassell Motor Car Company, Toledo, Ohio, has purchased a large plant on Detroit avenue and will increase capacity.

The W. A. Rogers Company, manufacturers of silver-plated ware, will move its plant from Oneida, N. Y., to Niagara Falls.

The plant of the Steam Appliance Company, of Batavia, N. Y., has been acquired by a Buffalo concern. Plant will be increased.

The U. S. Simplicity Road Grader Company will remodel the old stave and heading mill at Cumberland, Wis., and use it for its factory.

Three garages will be erected for H. T. Saunders on North Broad street, Philadelphia, Penn. Watson & Huckel, architects, are receiving estimates.

The Stuyvesant Motor Car Company, Cleveland, Ohio, has had plans prepared for a new four-story building at its plant on West Twenty-fifth street.

The Wightman-Rich Company, Inc., has been incorporated with a capital of $100,000 at Syracuse, N. Y., and will manufacture motors at that point.

At Warren, Ohio, the General Fire Extinguisher Company, of Providence, R. I., has awarded a contract for the construction of a concrete factory building.

The Myers Plane Company, Buffalo, N. Y., has been organized with $25,000 capital by C. Cary, B. Rumsey, W. F. Semon, to manufacture flying machines, etc.

The Kenosha (Wis.) Industrial Association has closed a contract with the Northwestern Can Company, of Chicago, to put up a plant to be occupied July 1.

Kluberstanz Brothers, manufacturers of galvanized iron and tin products, are planning a new factory at Twenty-third and Fond-du-Lac avenue, Milwaukee, Wis.

Ira B. Littlefield, Buffalo, N. Y., is arranging for the incorporation of a $100,000 concern to erect a factory in that city for making machinery and mill appliances.

The Johnston Harvester Company, Batavia, N. Y., will erect three additional buildings to its main plant, three and four stories high; also two additions to its malleable plant.

The Bridge Street Garage, Rutherford, N. J., has been incorporated to conduct an automobile garage. Capital, $100,000. Incorporators, S. D. Ely, M. E. Fake, J. S. Dressler.

The capacity of the plant of the Youngstown (Ohio) Bronze and Iron Foundry Company, at 548 Poland avenue, will be doubled. More than $10,000 will be spent in addition.

The Wells Foundry and Machine Company, East Gary, Ind., has been incorporated with a capital of $40,000 by George Earle, William Earle, V. E. Cook, S. E. Cook and C. W. Barnes.

The Prospect Manufacturing Company, Prospect, Ohio, has been incorporated with $10,000 capital to manufacture fire apparatus by B. K. Herbster, J. F. Moore, C. H. Sutphen, A. E. Johnson, etc.

The Denniston Company, Buffalo, N. Y., has been incorporated to manufacture motors, engines, machinery, vehicles. Capital, $150,-

000. Incorporators, E. E. Denniston, E. C. Anderson, F. U. Browne.

The Meteor Auto Tank Company, New York, has been incorporated to manufacture automobile tanks, lamps, chandeliers, etc. Capital, $50,000. Incorporators, G. Leveene, E. J. Bosse, S. J. Mayes.

The S. D. Helm Manufacturing Company, of Crawfordsville, Ind., has been incorporated with a capital of $15,000 by C. E. Lacey, W. H. O'Neall and Alice S. Lacey, to manufacture metal tanks.

The Brookins Company, Cleveland, Ohio, has been organized to manufacture and sell electrical and gas fixtures. Incorporators, Fred F. Klingman, C. S. Brookins, W. B. Chapman, etc. Capital, $50,000.

The Croxton Motor Car Company, of Massillon, Ohio, will move to Cleveland, occupying building vacated by the Baker Motor Vehicle Company on East Sixty-ninth street. New equipment will be needed.

The Hayes Track Appliance Company, of Geneva, N. Y., which manufactures derailing devices and other track appurtenances used by railroads, has purchased a tract of land in Richmond, Ind., and will erect a building.

The Auto Spring Wheel Company, Cincinnati, Ohio, has been incorporated with a capital of $10,000 to manufacture and sell automobile and other vehicle wheels. Incorporators, Alfred J. Swing, Wm. L. Kellogg, G. F. Ahrens, etc.

The Brightman Manufacturing Company, whose plant at Shelby, Ohio, was recently burned, will rebuild at Columbus, Ohio. The company makes shafting and shafting machinery and expects to have a plant in operation in three or four months.

The Leyson Supply Company has been incorporated at Syracuse, N. Y., and will take over the Standard Producing Company. The output will consist of surgical apparatus, and while manufacturing space will be leased for the present, a factory will be erected at a later date.

The Detroit (Mich.) Wheel Company has been incorporated with $1,000,000 capital to manufacture a new spring wheel for automobiles invented by Chas. R. Chisholm, who is one of the incorporators; A. W. Wier and F. A. Sweitzer, of Detroit, are the other incorporators.

The Sauer Motor Company, of New York and Chicago, recently incorporated with a $1,600,000 capital, has completed plans to locate its business at the plant of the Quincy, Manchester, Sargent Company, in Plainfield, N. J. An addition will be built to the plant. Motor cars, carriages, wagons, boats, etc., will be manufactured.

SOUTHERN STATES

Mr. Hansen, Davenport, S. D., will erect a blacksmith shop.

The Carr Furnace Company, Wheeling, W. Va., is erecting a foundry for making steel castings.

It is announced that the American Bridge Company will erect a $1,000,000 plant near Birmingham, Ala.

The Crawford Locomotive and Car Company, of Streator, Ill., is considering the removal of its plant to Richmond, Va.

The Merchants and Manufacturers Association, of Hagerstown, Md., is negotiating with the New York Central Iron Works, of Geneva, N. Y., to remove its plant to the former city.

WEST OF THE MISSISSIPPI

Jas. DeLancy, of Albion, Neb., will erect a blacksmith shop.

The Chapin (Tex.) Motor Car Company is improving its garage.

A three-story factory will be erected for the Los Angeles (Cal.) Can Company.

Fred E. Bates, of Northfield, Minn., will erect an addition to his machine shop.

Trell Miller, of Wood River, Neb., has commenced the erection of a blacksmith shop.

Harrison machine shop and garage, of Onawa, Iowa, will erect an addition this spring.

The Anheuser-Busch Brewing Company, St. Louis, Mo., will erect a four-story wagon factory.

H. Camp, Portland, Ore., will build a commercial garage. Modern repair machinery will be installed.

The Wood Brothers Thresher Company, Des Moines, Iowa, will erect a new factory building to cost $150,000.

The Grays Harbor Iron Works, at Hoquiam, Wash., is preparing to erect an addition, 40x110, as a foundry.

R. T. Lawrence, Spokane, Wash., will build a commercial garage and repair shop. Modern equipment will be installed.

The McDermott Surgical Instrument Company, 316 St. Charles street, New Orleans, La., has purchased site for a new factory.

The machine shops and equipment of Highland Park College, Des Moines, Iowa, was destroyed by fire. New shops are being planned.

Peter Westlin, Tacoma, Wash., is planning for the erection of a large foundry, pattern-making plant and machine shop at Modesto, Cal.

F. M. Davis, Los Angeles, Cal., will build a commercial garage on Stephenson avenue. Modern repair machinery, etc., will be installed.

The B. & P. Railway Company, Oroville, Cal., is in the market for an 8-inch lathe, shaper, bolt cutter and probably a trip hammer.

The Progressive Shoe Machinery Company, Minneapolis, Minn., has incorporated and will enlarge its factory at Nineteenth avenue and Franklin street.

Roy Laing and J. W. Hagar will build a commercial garage at Rialto, Cal. It will be equipped with all machinery necessary for this class of work.

The Portland (Ore.) Railway, Light and Power Company is planning the erection of a $300,000 repair plant and car shop on a site recently acquired.

The Angell-Redit Machine Company, Anaheim, Cal., now building a new machine shop, has been incorporated for $20,000 by E. E. Angell and D. G. Redit.

It is announced that the repair shop of the Missouri-Pacific railroad, at Smithville, Tex., was damaged to the extent of $20,000 by a locomotive boiler explosion.

The Colfax Harvester Company, Colfax, Wash., has been incorporated with a capital stock of $175,000. The company is having plans prepared for a factory for the manufacture of harvesters, etc.

The Tacoma Foundry and Machine Company, Tacoma, Wash., has been organized with a capital stock of $50,000. The company will immediately build a foundry and machine shop. William Webb is superintendent.

Glenn H. Curtiss has secured a lease on an aviation field at San Diego, Cal., and has announced that he will establish an aëroplane plant there; workshops, etc., now established at Hammondsport, N. Y., will be removed to this site.

H. S. Carver, formerly of Long Beach, Cal., has purchased property at Seattle, Wash., and will erect a factory for the manufacture of gas engines. He is associated with B. C. Tuttle, of Seattle. The firm will be known as the Carver-Tuttle Company.

The Southern Pacific Railroad, Los Angeles, Cal., will make an expenditure of $500,000 in improving its local shops; $100,000 will be immediately expended upon a mill shop for car and engine repairing; plans are now being prepared. Other improvements will follow.

The board of education of the high-school district, Long Beach, Cal., will receive bids up to March 7, for machinery for the polytechnic school. A full assortment of first-class equipment will be required. Information may be obtained from Superintendent J. D. Graham, High School, American avenue, Long Beach.

The Portland Railway, Light and Power Company, Portland, Ore., has purchased ten acres of property and will shortly commence the erection of large car shops; plans are being prepared. The plant will be erected in units, the present contemplated building to cost about $300,000. The plant will be thoroughly equipped with machinery necessary for the manufacture and repairing of rolling stock.

CANADA

The Ross Motor Car Company will locate a factory in Toronto.

The Jarvis Sanitary Filter Company will locate a factory in Toronto.

Chester Harris, of Brantford, will equip a large automobile repair shop.

The London Foundry Company, of London, Canada, will double its factory.

The Gillette Safety Razor Company will build a $100,000 factory in Montreal.

The Electrical Maintenance and Repairs Company will locate a factory in Toronto.

The Central Canada Iron and Steel Company, of Montreal, will locate a plant there.

The Climax Good Roads Machinery Company is building a new factory at Hamliton.

The Canadian Kellogg Company will build a factory at Montreal to manufcture valves and fittings.

George M. Ellis, of Winnipeg, has secured 30 acres on which to build a large automobile factory.

John Frankman, of Winnipeg, is head of the Winnipeg Bridge Company, which will build a factory there.

The Moloney Electric Company, of St. Louis, Mo., will locate a branch factory at Windsor, Ontario, for the manufacture of electrical supplies.

GENERAL MANUFACTURING

NEW ENGLAND

Charles C. Chase, Haverhill, Mass., will install a boiler.

Hennesey's Laundry, Providence, R. I., will install a boiler.

The Copley Trust Company, Boston, Mass., will install boilers.

Colby Academy, New London, N. H., will reëquip its power plant.

The Atlantic Company, Amesbury, Mass., is in the market for a band saw.

The Berkshire Cotton Company, Adams, Mass., will erect a 140,000-spindle mill.

The Lonsdale Company, Pawtucket, R. I., will install new power-house equipment.

J. D. Clark & Son, Rochdale, Mass., intend to rebuild their dyehouse, destroyed by fire.

The Southern New England Telephone Company will erect a building at Hartford, Conn.

The Rhode Island Coöperative Coal Company, Providence, R. I., will install a boiler.

The Diamond State Fiber Company, Bridgeport, Mass., will install a new boiler plant.

The General Electric Company, Lynn, Mass., is making large additions to its power-plant equipment.

The plant of A. J. Morse & Son, Boston, Mass., makers of diving apparatus, was badly damaged by fire.

The Waterville (Me.) & Fairfield Railway and Light Company will purchase a 400-kilowatt turbogenerator.

The Stanley plant of the General Electric Company, at Great Barrington, Mass., is to install new machinery.

The Naugatuck (Conn.) Chemical Company has reorganized with $500,000 capital stock. Extensive alterations are planned.

The plant of the Crown Shoe Company, Boston, Mass., owned by King Corporation, of Lynn, Mass., was damaged by fire.

The New England Canning Company, Eastport, Me., is in the market for a direct-connected generator for lighting purposes.

The gas-generating plant of the Boston & Maine Railroad, at East Deerfield, Mass., was destroyed by an explosion. Loss, $25,000.

A. H. Sleeper, Swampscott, Mass., has purchased the Vaughn Machine Works, at South Peabody, Mass., and will convert same into a tannery.

The Boston & Maine Railroad is planning to equip for electrical operation the section which goes to the summit of Mt. Washington. It is proposed to erect a power plant at the base of the mountain.

MIDDLE STATES

Henry Dolflinger, Philadelphia, Penn., will erect a new dairy.

The Toledo (Ohio) Screen Company will erect a new factory.

The Prairie Farms (Wis.) Creamery Association will erect a plant.

David McKay, publisher, Philadelphia, Penn., will enlarge its plant.

The Mott Wheel Works, Utica, N. Y., is planning to erect an addition.

The National Pottery Company, Evansville, Ind., is building an addition.

The Milroy Roller Mill, owned by J. M. Gwinn, Milroy, Ind., was burned.

O. S. and S. M. Dingee, Huntington, Ind., will build a large canning factory.

Fire destroyed the plant of the Paragon Insulating Company, Findlay, Ohio.

The Harmony Mills Company, Cohoes, N. Y., will make extensive improvements.

The Union Thread Company, of Cincinnati, Ohio, will erect a factory in Carthage.

The Bergner & Engle Brewing Company will erect a brewery in Lancaster, Penn.

Two-story addition is being built at Dill & Collins paper mill, Philadelphia, Penn.

The United Drug Company, of Boston, will build a $750,000 plant at Kansas City, Mo.

The county of Otsego, N. Y., will build and equip a power house at Phœnix Mills, N. Y.

Baraboo, Wis., is considering the building of a municipal electric-light and power plant.

Fire destroyed the plant of the National Refining Company, Findlay, Ohio. Will be rebuilt.

The Tonawanda Brewing Company, Tonawanda, N. Y., is planning to enlarge its brewery.

The Merrill Veneer Company, of Merrill, Wis., will erect a factory. W. A. Runge, secretary.

The Mayville (Wis.) Flour and Grist Mill, owned by the Northwestern Iron Company, was burned.

Fire destroyed the factory of the A. B. Felgemacher Organ Company, Erie, Penn. Loss, $50,000.

The Massillon (Ohio) Sign and Poster Company will move into new quarters and add new equipment.

The Union Peat Company, of Toledo, Ohio, a new concern, will install a plant near Mansfield, Ohio.

The Indianapolis (Ind.) Brewing Company is to make improvements in its power plant to cost about $10,000.

Fire partly destroyed the woolen-goods plant of the Somerset Manufacturing Company, Raritan, N. J.

The plant of H. Bischoff & Co., Brooklyn, N. Y., chocolate manufacturers, was destroyed by fire. Loss, $100,000.

The Lakeside Paper Company, of Appleton, Wis., is considering the erection of a paper mill at Telulah Springs.

The Hammerschlag Manufacturing Company, Garfield, N. J., will install a new gas engine in its power plant.

The Hammermill Paper Mill, Erie, Penn., has awarded contract for the erection of an addition to cost $140,000.

The Peoples Packing Company, Cleveland, Ohio, is building a new tank house and an addition to its boiler plant.

The De Laval Steam Turbine Company, Trenton, N. J., will be in the market for two 250-horsepower tubular boilers.

The Pabst Brewing Company will build a $32,000 addition to its plant at Ninth and Prairie streets, Milwaukee, Wis.

The International Fertilizer Company has purchased site at Toledo, Ohio, on which a $400,000 plant will be erected.

The Eau Claire Concrete Company has secured a site at Menominee, Wis., for the erection of a concrete block factory.

The Schwarzenbach-Huber Company, West Hoboken, N. J., will install a new engine and boiler in its plant on Oak street.

The Wausau (Wis.) Fixture and Furniture Company has decided to improve its plant and install additional equipment.

The Miller Shoe Company, of Cincinnati, Ohio, will start a factory for the manufacture of shoe uppers at Greensburg, Ind.

The Schriehart Brewing Company, at Manitowac, Wis., will spend $15,000 in improvements. New engine room will be built.

Plans are being prepared for a two-story bottling building for the Akron Brewing Company, of Akron, Ohio. The cost will be about $30,000.

The William B. Saunders Company, Philadelphia, Penn., publishing medical books, is having plans prepared for an eight-story building.

The Automatic Tubing Works, Edward Danieli, secretary-treasurer, will erect a factory for the manufacture of steel tubing at Menominee, Mich.

The Paragon Plaster Company, Syracuse, N. Y., has decided to build an addition to its plant for the manufacture of concrete blocks and other building material.

The Commercial Club, of Menominee, Mich., has secured the location of the Empire Portland Cement Company, of Portsmouth, Ohio. A $500,000 plant will be erected.

The Acme White Lead and Color Works, Detroit, Mich., has recently purchased an old plant at Detroit, which they will remodel for the manufacture of a heavy paint.

Spalding & Sons Company, of North Rochester, N. H., leatherboard manufacturer, has secured an option on a site in Tonawanda, N. Y., where it considers erecting a $1,000,000 factory.

G. J. Hartley, of Mattoon, Ill., J. D. Abernathy, and others, are promoting a canning factory at that point, to be known as the Hartley Canning Company. It is proposed to erect three buildings.

The Columbia Shoe Manufacturing Company, Cincinnati, Ohio, has been incorporated with $50,000 capital to manufacture and sell shoes and boots, by Alfred J. Swing, Wm. J. McCauley, G. A. Ginter, etc.

The Citizens' Electric Light and Power Company of Yonkers, N. Y., is being organized as a competitor of the Westchester Lighting Company. John H. Coyne is preparing incorporation papers. Capital, $100,000.

The Pioneer Pole and Shaft Company has decided to move its factories located at Ashtabula, Akron, and Wellington, Ohio, to Cairo, Ill., at which point they contemplate spending $150,000 in buildings and improvements.

A new furniture company to be known as the Danziger Furniture Company, has been incorporated with a capital of $60,000. Its plant will be located at Shelbyville, Ind. Charles A. Spiegel, president; H. J. Root, vice-president.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids February 28, for twist drills, machinists' hammers, pliers, hand reamers (schedule 3343), cast-steel crucible wire (schedule 3346), brass-pipe fittings, cast-iron unions, elbows (schedule 3349).

The Director of Public Service, Cleveland, Ohio, is endeavoring to obtain authority for extensions to the municipal lighting plant. Has been authorized to make purchases for the water department, including valves, hydrants, lead pipe, lubricants, etc., and electric meter, transformers, arc lamps, etc., for the lighting plant.

SOUTHERN STATES

The Lexington Hotel, Richmond, Va., will install a new refrigerating system.

The Birmingham (Ala.) Buggy Company is planning the erection of a new plant.

The American Standard Asphalt Company, Louisville, Ky., will erect a factory at 224 East Lee street.

The Richmond & Henrica Railway Company is erecting a new power house in Richmond, Va.

The Tidewater Power Company, Wilmington, N. C., will soon be in the market for a boiler, a 500-kilowatt rotary converter and two 200-kilowatt transformers.

The Isthmian Canal Commission, Washington, D. C., will receive bids up to 10:30 a.m., March 3, for manganese steel castings, steel castings, wire rope, gear and milling cutters, auger bits, foundry core machine, electric fans, as per Circular No. 622.

WEST OF THE MISSISSIPPI

A. Olsen, Gold Hill, Ore., will build a $10,000 ice plant.

The city of Davenport, Wash., will install a new sewer system.

The Northwest Paper Company is to erect a $450,000 plant at Brainerd, Minn.

J. S. Lane, of Stephen, Minn., may establish a cement works at Spooner, Minn.

The city of Burlington, Wash., is having plans prepared for a new sewer system.

The Model Button Company, of Muscatine, Iowa, will install a finishing department.

Fred N. Cross has been granted franchise for an electric plant at Central City, Iowa.

The Askov, Minn., Creamery Association has secured a site for the building of a creamery.

Polenske Schellak & Co. are planning the erection of a brick plant at Hastings, Neb.

The city of Redlands, Cal., is planning for the installation of a municipal water system.

The city of Lebanon, Ore., will install a new sewer system; $70,000 will be expended.

The Clipper Shingle Company, Acme, Wash., is planning for the erection of a new shingle mill.

E. E. Lynch, of Belle Fourche, S. D., is considering the establishment of a broom factory.

The American Cereal Company, Baker City, Ore., is planning to build a factory in this vicinity.

The W. E. Ford Company, Hedgesville, Mont., will build a lumber-mill plant in this vicinity.

The Chapin (Tex.) Motor Car Company will install a small electric-light plant in the near future.

The board of public works, Seattle, Wash., will install a refrigerating plant in the municipal building.

J. C. Hudson, Tekoa, Wash., will build a flour mill of 150 barrels daily capacity, at Rosalia, Wash.

The Pacific Graphite Company (T. S. Mackie), Everett, Wash., will build a large graphite factory.

William Poesch, of Columbus, Neb., will erect a modern candy factry at Thirteenth and Olive streets.

The Spokane Glove factory (J. W. Clason), Spokane, Wash., is planning for the erection of a new factory.

A. Mullaly, Los Angeles, Cal., has taken out a permit to erect a factory for the manufacture of baskets.

H. Van Allen, Redmond, Ore., is at the head of an enterprise to erect an ice-making and cold-storage plant.

The creamery owned by Geo. Jensen, F. A. Reidell and John Bandess, Cedar Falls, Iowa, was destroyed by fire.

The Pierce Power Company, Pierce City, Idaho, is planning for the erection of a power plant in this vicinity.

The Interior Warehouse Company, Turner, Ore., is planning for the erection of a power plant in this vicinity.

The Pacific Graphite Company, T. S. Mackie, local representative, will establish a plant at Everett, Wash.

C. E. Williams, Hoquiam, Wash., is contemplating the erection of a factory for the manufacture of excelsior.

William Vancil, Milton, Ore., will build a fruit-drying factory; all machinery necessary for operation will be installed.

The Pacific Power and Light Company, Portland, Ore., will build a power house at Pasco, Wash., to cost $500,000.

The oil refinery of the Standard Oil Company, at Point Richmond, Cal., was damaged by fire to the extent of $500,000.

The Nall-Welty Lumber Company, Tacoma, Wash., will build a new factory for the manufacture of finished wood products.

The Grays Harbor Railway and Light Company, Aberdeen, Wash., is planning to increase the capacity of its power plant.

The Shenandoah (Iowa) Light, Power and Heat Company expects to put up a $12,000 modern artificial ice plant next spring.

The Pacific Creosoting Company, Eagle Harbor, Wash., is contemplating the erection of a creosoting plant at Bellingham, Wash.

The Associated Oil Company, Bakersfield, Cal., is reported to be contemplating the erection of a refinery plant at Port Costa, Cal.

The Idaho Pine Lumber Company, Spokane, Wash., is planning to build a sawmill in Paradse valley, of 10,000 feet daily capacity.

The city of South Pasadena, Cal., is agitating the question of a municipal power plant. An estimate is being made as to possible cost.

The Sprague Company, Pierce City, Idaho, is planning for the erection of a hydroelectric plant for mines operation in this district.

The Pittsburg-Idaho Mining Company, operating in the vicinity of Gilmore, Idaho, is at the head of a project to build a power plant.

The San Dimas Lemon Association, San Dimas, Cal., is planning to enlarge its packing house. Modern machinery will be installed.

The Danish Creamery Association, Fresno, Cal., is having plans prepared for a new factory. A complete bottling plant will be installed.

Harry S. Worthman, Emmett, Idaho, is asking for bids on centrifugal pumps for the reclamation service Salt river project in Arizona.

The Great Western Power Company, Oroville, Cal., will make improvements in its power plant at Big Bend to cost about $200,000.

The Smith-Welte Shingle Company, Enumclaw, Wash., is planning for the erection of a planing mill in connection with its present plant.

The Great Western Milling Company, of Minneapolis, has acquired possession of the flour mill at Dundas, Minn., and will enlarge and improve it.

The Humboldt Irrigation and Water Power Company, Lovelock, Nev., will be in the market for a 150-horsepower gas engine; also generator, transformer and switchboard. S. R. Young, manager.

The Southern California Gas Company, Los Angeles, Cal., is planning to install a gasworks system at Glendale. About $50,000 will be expended.

The James Marshall Manufacturing Company (show cases, store fixtures, etc.), Portland, Ore., has purchased a site and will erect a new factory.

The Carnegie Oilfields, Ltd., operating at M'Kittrick field, near Bakersfield, Cal., is planning for the installation of a large water system on its property.

Power-plant equipment will be required in the 12-story building to be erected at Portland, Ore., by the Princeton Trust Company. Plans are being prepared.

Lon C. Hall, Harlingen, Tex., is having plans prepared for a 400-ton sugar plant. He is contemplating the erection of similar plants in the near future.

The Doernbecher Manufacturing Company, Portland, Ore., manufacturing furniture, will enlarge its factory in Sullivan gulch. New machinery will be installed.

The Sierra Madre Citrus Association, Sierra Madre, Cal., will build an addition to its packing house in Lamanda park. Modern machinery will be installed.

The Jackson Creek Company (W. J. Pennington), Burlington, Wash., is planning for the erection of a cement plant in the vicinity of New Westminster, B. C.

The Washington Broom and Woodenware Company, Seattle, Wash., is contemplating an addition to its plant; improvements will also be made in present equipment.

The San Diego Stone Company, San Diego, Cal., will install a new stone crusher, air-compressor plant and additional equipment at its quarries in Spring Valley.

M. A. Gardner and M. L. Camburn, Elsinore, Cal., have been granted a gas franchise and will soon commence operations on a natural-gas plant for the vicinity.

The Truckee River General Electric Company, Reno, Nev., is preparing to install a 3200-horsepower hydroelectric plant. Engineers, Stone & Webster, Boston, Mass.

The substation of the city lighting plant, at Pocatello, Idaho, owned by ex-Governor Brady, of this city, was destroyed by a flood; the transformer station was also demolished.

The Stewart Fruit Company, Chula Vista (near San Diego), Cal., will build a large addition to its packing house. New machinery and a precooling plant will be installed.

The Olympia Brewing Company, of Pasco, Wash., is having plans made for a $35,000 refrigeration plant and cold-storage warehouses at Pasco, Olympia and Hoquiam, Wash.

The plant of Glass & Proudhomme, Portland, Ore., one of the largest printing and binding establishments in the city, was destroyed by fire. Loss, $50,000.

The Pacific Telephone and Telegraph Company, Spokane, Wash., is planning for extensive improvements in this district. A new seven-story building will soon be erected. About $200,000 wil be expended.

The Puyallup Veneer Panel and Fir Door Company has been incorporated at Puyallup, Wash., with a capital stock of $30,000 by A. W. Gough and A. A. Rankin. The company is planning to build a factory.

The Pacific Coast Biscuit Company, Los Angeles, Cal., will enlarge its plant by building a new factory to cost about $75,000. Construction will begin at once. C. M. Warner, Syracuse, N. Y., is president of this company.

The L Sierra Heights Water Company has been incorporated at San Francisco, Cal., by J. E. Coberly, Edwin Higgins and H. G. Hubbard, with a capital stock of $1,000,000. The company will operate extensively in this vicinity.

The San Joaquin Light and Power Company, Fresno, Cal., operating the gas plant at Merced, Cal., is planning to rebuild its entire system; the present gas works will be entirely reconstructed. About $25,000 will be expended.

J. A. Whitehead, Cassel (Shasta county), Cal., has purchased property on Hot creek, in this section, and contemplates the erection of a power house. The Pacific Power Company was some time ago promoted by Mr. Whitehead.

The Los Angeles Creamery Company, manufacturing ice cream, etc., Los Angeles, Cal., is having plans prepared for a large addition to its plant. Complete machinery equipment will be installed for the manufacture of its specialties.

The Sierra & San Francisco Power Company has been incorporated at Redwood City, Cal., for $20,000,000 by J. S. Thornton and Winfield Dorn. The company's headquarters will be at Millbrae, Cal. The company is planning extensive work.

Aasen Brothers, operating the Coquille Mill and Mercantile plant, at Coquille, Ore., will rebuild their plant recently destroyed by a boiler explosion. The company is engaged in lumber work, and will thoroughly equip the new plant with machinery.

Sidney and R. E. Abenheim, Douglas, Ariz., are at the head of a company which has purchased the Mababi Rancho, near Douglas. The company is planning for extensive work. Sawmills will be built and a fruit and vegetable cannery is contemplated.

The Navidad Mines and Reduction Company, Berkeley, Cal., operating in the San Sebastian district, Jalisco, Mexico, will build a new 800-horsepower power plant in this

section; about $150,000 will be expended. Plans are now being prepared.

E. W. Demerest and Lynn Miller, operating the D & M Lumber Company, at Tacoma, Wash., have purchased the business of the Meyers Lumber Company, including the planing mill at South Prairie. This mill will be overhauled and new machinery installed.

R. G. Arthur, Bisbee, Ariz., has been granted a franchise from the county supervisors for an electric-light and power plant at Benson, Ariz. A company will be organized, comprising M. J. Cunningham and S. F. Maguire, and soon commence operations.

The California Power and Manufacturing Company has been incorporated at San Francisco, Cal., with a capital of $5,000,000 by F. G. Baum, C. W. Slack and C. S. Goodrich. The company is planning for extensive power-plant work in northern California.

The People's Steam Laundry Company has been incorporated at Santa Ana, Cal., by J. W. Shaul, J. T. Wilson and E. S. Miller, with a capital stock of $25,000. The company will immediately begin the erection of a building and equip it with modern steam-laundry machinery.

B. G. Wayne, New York City, formerly in the Government employ, is now at Mountainhome, Idaho, and is at the head of an enterprise for extensive irrigation work in this vicinity; it will cause an expenditure of about $8,000,000. An enormous pumping plant will be installed.

The American Keene Cement Company, Richfield, Utah, a new organization, will soon commence the construction of a plaster mill and marble mill at Sigurd, Utah. The company wil also build a cement plant at Medicine Lodge, Kan. About $300,000 will be expended in this work.

The Berrendo Irrigated Farms Company, Roswell, Ariz., which recently purchased the plant of the Roswell Electric Light and Power Company, is planning to expend $250,000 on improvements. New pumping equipment and machinery will be installed; high power machinery will be required.

The Monterey Railway Light and Power Company, Monterey, Mexico, will receive bids up to March 1 for the erection of a gas plant to serve a city of 85,000. Plans and specifications at the company's office. Address, Lewis Luke, general manager, P. O. Box 58, Monterey, Mexico.

The Development and Securities Company, Long Beach, Cal. (O. E. Cook, president), is planning to expend $100,000 in new machinery for its rock property in the vicinity of Redland, Cal. New rock-crushing equipment will be installed. The company is also planning the erection of a plant for the manufacture of concrete posts and cement products.

The Pacific Gas and Electric Company, Sacramento, Cal., will build a 15,000-horsepower steam plant to cost about $500,000. The company is also planning to improve the local street-railway system, and will make extensive additions to its gas plant. Work on the steam plant will commence immediately. Headquarters of the company at San Francisco.

The California Granite Company has been organized at Porterville, Cal., by H. G. Reinhardt and R. G. Williams, with $150,000 capital stock. The company will at once begin operations in the black marble quarries in this section. Machinery for thoroughly equipping the properties will be purchased; a finishing mill to turn out monumental stone will be erected.

CANADA

Dundas, Ont., will install complete hydro-electric machinery.

The Chapman Brick Company will establish a plant in Toronto.

The Durable Box Company, of Toronto, will locate a large factory there.

The London Street Railway Company will install a complete new steam plant.

Messrs. L. McBrine & Co., of Berlin, Ont., will double their large trunk factory.

Renfrew, Ont., will spend $150,000 for machinery for developing electric power.

The Canadian Pearl Button Company, of Trenton, Ont., will build a factory there.

The Lethbridge Brick Company will equip a big factory at Sault Ste. Marie, Ont.

The Imperial Oil Company, of Sarnia, Ont., will make important extensions to its plant.

The Independent Glass Producers Company, of Toronto, is building a large new factory.

P. Burns will install a paving plant at Strathcona, Alberta, which will cost $1,500,000.

The printing plant of the *Montreal Herald*, which was completely wrecked by fire, will be replaced.

The Eastern Canada Power and Pulp Company will equip an immense plant at Nairn Falls, Quebec.

J. L. McLeod, of Liverpool, N. S., is interested in a company which will develop water powers.

The city of Edmonton, Alberta, will equip a plant on the Athabasca river to develop 60,000 horsepower.

St. Catherines, Ont., is in the market for a large quantity of special gate valves and pipes for waterworks.

E. R. Pepin, of St. Basile, Que., is head of the new Eastern Paper Company, which will locate a big plant there.

The Edmonton (Alberta) Heat and Power Company will build an immense power-development plant on the Saskatchewan river.

The large pulp mill of G. D. Campbell, at Weymouth, N. S., completely destroyed by fire, will be reëquipped at once. Loss, $75,000.

The P. Burns Company, of Vancouver, will spend $250,000 extending its abattoir plant and the latest machinery will be installed.

William Northcott, purchasing agent for Victoria, B. C., will buy 350 four-inch, 100 six-inch and ten 12-inch double-gate valves before March 3.

The Campbell Lumber Company, whose big mills, at Weymouth Bridge, N. S., were completely destroyed by fire, will install new machinery at once.

The large sawmill and woodworking factory of W. Hayden, destroyed by fire, at Woodstock, N. B., will be reëquipped with modern machinery.

MINING

The Fruitvale mine, Grass Valley district, Cal., will install a 10-stamp mill.

The Old Judge mine, Gold Circle district (Midas), Nev., will install a new mill.

The Midway Five Oil Company, operating at Taft, Cal., will install new equipment.

The San Guillermo mine, Hildago, Mexico, is planning to install a 350-horsepower hoist.

The Webster mine, Marysvale district, Utah, is planning to install a reduction plant.

The Empire Mining Company, operating near Mackay, Idaho, will install new machinery.

The Jarbidge Paviak Mining Company, operating at Jarbidge, Nev., will install new machinery.

The Aurora mine, Chloride, near Kingman, Ariz., will install new hoisting and pumping equipment.

The Germania Mining Company, at Rochester, Mont., will erect a mill on its property next spring.

Sidney Logan, Kalispell, Mont., will install a stamp mill on his mining property, near Libby, Mont.

The Butler mines, Buchanan district, Tuolumne county, Cal., is planning to install new machinery.

The Union Hill mine, Grass Valley district, Cal. (Nevada county), is planning to install a 20-stamp mill.

The Goldfield Belmont mine, Black Butte district, Nevada, is planning for extensive development work.

The Wedge mine, operating in the Marysvale district, Utah, is planning for extensive development work.

The Sonora & Duffield mines, near Arastraville, Tuolumne county, Cal., are building a new 10-stamp mill.

The Wedekind mines, near Reno, Nev., will install new pumping equipment; pumps will be of large capacity.

The Black Hills Smelting Company, Galena, S. D., H. C. Ostermann, principal stockholder, will erect a smelter.

The Argentina & Anexas mines, in the Parral district, Mexico, are planning for extensive development work.

The Victoria Mining Company, operating at Eureka, Utah, is contemplating the installation of aërial tramway.

The Pioneer Consolidated Mining Company, operating near Rhyolite, Nev., is planning for extensive development work.

The Pacific Mining Company, operating at American Fork, Utah, is contemplating the installation of a milling plant.

Doctor Jarvis, Eugene, Ore., is planning for extensive development work in his asbestos property in this vicinity.

Chas. M. Hampsons and Lewis Dixon, operating in oil property, near Moab, Utah, will install new drilling equipment.

The Rescue-Eula mine, in the Tonopah district, Nye county, Nev., will install new machine drills in the near future.

The North Star Mines, operating in Grass Valley, Cal., is planning to install a new hoisting and pumping equipment.

The Kalispel-Lincoln Mining and Milling Company, operating near Libby, Mont., is planning to install a stamp mill.

The Ohio Copper Company, Bingham, Utah, is contemplating the installation of considerable new equipment at its mines.

The Arizona Copper-Gold Mining Company, operating at Cherry Creek, Prescott district, Ariz., will install new machinery.

The Rossi mine, Cortez district, Nevada, has been acquired by new interests and extensive development work is planned.

The United States Tungsten Company, operating near Ely, Nev., is building a new concentrating mill of 100 tons capacity.

The Eagle Bird mine, near Washington, Nevada county, Cal., will install a 20-stamp mill and new pumping plant in the spring, 1911.

The Yellow Pine mine, Yellow Pine district, Clark county, Nevada, and associated interests, are building a new oxide plant at San Pedro.

The Real del Monte & Pachuca Company, operating in the Pachuca district, Hidalgo, Mexico, will increase the capacity of its Loreto mill.

The Rising Sun mine, operating in the Kelsey district, near Georgetown, Cal., is contemplating increasing the capacity of its stamp mill.

The Cascade Gold Mining and Milling Company, operating in the Marysvale district, Utah, will erect a milling plant in the near future.

The Sacramento Valley Mining Company, operating near Kingman, Ariz., will install new hoisting equipment. Extensive operations are planned.

It is announced that the Mining Association Mining and Sampling Company, Boulder, Colo., will build a custom mill, concentrator and cyanide plant.

The Almoloya Mining Company, Mexico City, Mex., operating in the Ameca district, Jalisco, is planning to increase the capacity of its concentrating plant.

The Nevada-Utah Company, Pioche, Nev., is planning to extend its railroad to the Prince Consolidated mine; a mill will be erected at Pioche of large capacity.

The Davenport-Independent Mining Company, operating in the Gold Range mining district, vicinity of Mina, Nev., is contemplating the installation of a milling plant.

The Afterthought Copper Company, operating at Ingot, Shasta county, Cal., is planning for extensive development work. A railroad will be built from Ingot to Bella Vista.

The Sunset Development Company, operating at La Barranca, Sonora, Mexico, is contemplating the installation of an aërial tramway. The company will also install a gas-producer plant.

The Tarantula mine, near Orville, Cal., is now engaged in increasing the capacity of its mill 20 stamps. In the near future the company contemplates furthering this capacity to 100 stamps.

The Pacific Smelting and Refining Company, operating a smelting plant at Guaymas, Mexico, will install an electrostatic plant for the separation of zinc in the lead ores in the near future.

The Zapote mines, Ameca district, Jalisco, Mexico, have been taken over by E. A. Montgomery, Los Angeles, Cal. Extensive development work is planned; new steam-hoisting equipment will be installed.

The Eastern Trading and Oil Company has been organized at Porterville, Cal., with a capital of $500,000. The company is planning for extensive work in Tulare county and will install considerable drilling equipment. S. R. Shoup, Los Angeles, Cal., is the head of this company.

The Mexican Premier Oil Company has been incorporated at Phœnix, Ariz., by Robley D. Evans (rear admiral) and William Wallace, with a capital stock of $2,000,000. The company has acquired property in the Tampico oilfields, Mexico, and is planning for extensive operations. The company is fully financed and no stock is offered for sale.

Trade Catalogs

Barber-Colman Company, Rockford, Ill. Catalog. Milling cutters. Illustrated, 88 pages, 5x7½ inches, paper.

Whiting Foundry Equipment Company, Harvey, Ill. Catalog No. 82. Cranes. Illustrated, 40 pages, 6x9 inches.

De Laval Steam Turbine Company, Trenton, N. J. Catalog A. Steam turbines. Illustrated, 120 pages, 6x9 inches, paper.

National Machine Recorder Company, Marquette building, Chicago, Ill. Booklet. "Shop Efficiency." Illustrated, 24 pages, 5x6½ inches.

The National-Acme Manufacturing Company, Cleveland, Ohio. Booklet. The Production of Duplicate Parts. Illustrated, 30 pages, 5x6½ inches.

Gould & Eberhardt, Newark, N. J. Catalog. Shapers. Illustrated, 48 pages, 6x9 inches, paper. Pamphlet. Practical hints and instruction for operating automatic gear-cutting machines and gear-cutter grinders. Illustrated, 36 pages, 6x9 inches.

Forthcoming Meetings

The Cincinnati branch of the National Metal Trades Association will hold its annual meeting at the Business Mens' Club, Thursday evening, March 2.

American Supply and Machinery Manufacturers' Association, National Supply and Machinery Dealers' Association and Southern Supply and Machinery Dealers' Association; joint annual convention, Hotel Seelbach, Louisville, Ky., April 3-5, 1911. F. D. Mitchell, secretary, 309 Broadway, New York City.

National Metal Trades Association, annual meeting, April 14, 1911, New York City, Hotel Astor. Robert Wust, commissioner, New England building, Cleveland, Ohio.

American Foundrymen's Association, annual convention, Pittsburg, Penn., May 23 to 26, 1911. Richard Moldenke, secretary, Watchung, N. J.

American Society of Mechanical Engineers; monthly meeting second Tuesday. Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York City.

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month, Young's hotel. D. F. S. Clark, secretary, 141 Milk street, Boston, Mass.

Providence Association of Mechanical Engineers. Monthly meeting fourth Tuesday each month. E. C. Bliss, president, 91 Sabine street, Providence, R. I.

New England Foundrymen's Association; regular meeting second Wednesday of each month, Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Engineers' Society of Western Pennsylvania; monthly meeting third Tuesday. Elmer K. Hiles, secretary, Fulton building, Pittsburg, Penn.

Superintendents' and Foremen's Club of Cleveland; monthly meeting third Saturday, Philip Frankel, secretary, 310 New England building, Cleveland, O.

Western Society of Engineers, Chicago, Ill. Regular meeting first Wednesday evening of each month, excepting July and August. Secretary, J. H. Warder, 1735 Monadnock block, Chicago, Ill.

Philadelphia Foundrymen's Association; meetings first Wednesday of each month, Manufacturers Club, Philadelphia, Penn. Howard Evans, secretary, Pier 45 North, Philadelphia, Penn.

The Western Smelters Corporation, Carson City, Nev., is making extensive improvements in its plant and adding new machinery preparatory to building its contemplated power plant, ground for which is being cleared.

WANTS

Rate 25 cents per line for each insertion. About six words make a line. No advertisements abbreviated. Copy should be sent to reach us not later than Friday for ensuing week's issue. Answers addressed to our care, 505 Pearl Street, New York, will be forwarded. Applicants may specify names to which their replies are not to be forwarded, but replies will not be returned. If not forwarded, they will be destroyed without notice. No information given by us regarding any advertiser using box number. Original letters of recommendations or other papers of value should not be inclosed to unknown correspondents. Only bona-fide advertisements inserted under this heading. No advertising accepted from any agency, association or individual charging a fee for "registration," or a commission on wages of successful applicants for situations.

Miscellaneous Wants

Caliper catalog free. E.G.Smith, Columbia, Pa.

We buy or pay royalty for good patented machine or tool. Box 282, Amer. Machinist.

Wanted—Work for screw machines and gear cutter. Box 775, American Machinist.

Light, fine machinery to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Wanted—Contract work or medium weight specialties to build. Wm. A. Cather, Pottsville, Penn.

Light and medium weight machinery and duplicate parts built to order; tools, jigs, etc. MacCordy Mfg. Co., Amsterdam, N. Y.

The Brunswick Refrigerating Co., of New Brunswick, N. J., are prepared to take on one or more manufacturing propositions.

Wanted—Light and medium weight special machinery, jigs and fixtures, punches and dies, etc., to build to order. Box 520, Am. M.

Wanted—To purchase established general machine shop in live town of 5000 to 10,000; give name of banker. Box 457, Am. Mach.

Patents. C. L. Parker, Patent Attorney, ex-examiner Patent Office, 990 G St., Washington, D. C. Write for Inventor's Handbook.

Agency for machinery and tools, covering Pittsburg district, is wanted by well known and established engineer. "Engineer," Box 491, American Machinist.

Wanted—An article to manufacture suitable for the railway, automobile or hardware trade; must be patented and exclusive. Address Box 356, American Machinist.

Light and medium weight machinery and small parts in quantities; also screw machine and punch press work, tools, jigs, dies and high grade machinery. The Elgin Tool Works, Elgin, Ill.

Tools, dies, jigs and light and medium weight machinery designed and built to order; duplicate parts, either machined or die cast. Precision Die Casting Co., 422 So. West St., Syracuse, N. Y.

Large English firm of machine tool importers having showrooms and offices in Great Britain, France, Germany, Italy, India and Japan is wanting good agencies for machine tools of all kinds. Box 189, Amer. Mach.

Cummings Machine Company, 238 William street, New York. Estimates given on automatic machinery, bone hardening, grinding and jobbing; uptodate plant; highest grade work done with accuracy and despatch. 'Phone 5592 Beekman.

Welding by oxyacetylene process; special attention given to repairs of machinery and castings of all kinds; large experience in difficult experimental work; structural shapes welded together. Write for particulars. Krajewski-Pesant Company, 54 Beard St., Brooklyn, N. Y.

Wanted—Partner with $5000 to invest in well established business; one who is not afraid of work; must be either a good mechanic, or a good business man; this will secure a one-fourth interest in a $30,000 corporation; year's work on hand. Box 519, American Machinist.

Wanted—Partner with moderate capital in a growing business, no incumbrance, in a manufacturing center in Canada; must possess a thorough knowledge of how to produce small, interchangeable parts requiring accurate assembling for mechanics' tools; also gear cutting. Apply G. Sharp, 200 Mance St., Montreal.

We operate a well equipped machine shop for all kinds of accurate work; we assist in developing ideas or designing machinery to accomplish certain results, overcoming imperfections in construction or design; we invite correspondence; estimates furnished; prices reasonable. E. V. Bailiard Company, 18 Frankfort St., New York City.

Wanted—Factory location; we are looking for a new factory location for our machine shop and foundry; we build heavy machinery and must have a side track and buildings suitable for electric traveling cranes; any factory sites or buildings that any city or commercial club has to offer will be considered. Bertsch & Co., Cambridge City, Ind.

Do you want machine work? Concern with live and well equipped office in metropolitan city, maintaining a competent sales force and engineering staff, now in alliance with one contracting machine shop, has surplus of orders and desires to form another alliance for the manufacture of its constructions; these units, averaging two and a half to four hundred pounds, are essential elements of automobile construction, are marketed in large lots and demand quantity production from accurate jigs and fixtures and modern machine tools; we have a half million of business to place this year on orders from responsible purchasers, and we possess every facility and ability required to increase this amount; we do not need financing and will not finance. We will not entertain an alliance with any but thoroughly wide awake manufactories whose finances, integrity and capacity or ability to increase capacity are unquestionable. Box 527, Amer. Machinist.

HELP WANTED

Classification indicates present address of advertiser, nothing else.

CANADA

Draftsmen, experienced on gun, typewriter or sewing machine tool and fixture work; men with shop experience preferred. Box 477, AMERICAN MACHINIST.

Wanted—Speed boss for machine tools in a large electrical factory; must be thoroughly competent. Applicants state age, experience, salary expected. Apply Canadian General Electric Co., Peterborough, Ont.

CONNECTICUT

Wanted—A first class temperer, with experience in hardening German high-grade steel; permanent position in Connecticut; give age and references. Box 446, AM. MACH.

ILLINOIS

Wanted—Foreman for light structural iron and heavy automatic machinery assembling department; must be excellent mechanic; good salary; permanent position. Box 524, AMERICAN MACHINIST.

Wanted—Experienced brass foundry foreman for foundry employing twelve molders, using latest equipment, making high class castings only; good salary; permanent position. Box 523, AMERICAN MACHINIST.

Wanted—High class general foreman for machine shop making special automatic machines, employing three hundred and fifty men; permanent position; good salary; only high grade men need apply. Box 525, AM. M.

Draftsmen—For tool drafting work; we need men who have had experience as designers on punch and die or jig and fixture work; in answer, state fully your experience along this line of work, salary desired and how soon you could report. Address Department 1056, Western Electric Co., Chicago.

Wanted—A modern production boss for machine shop steam engine manufacturing company located in Middle West, wants to put in charge of its machine shop a man who will develop labor-saving devices and build up the working force to higher state of efficiency; number of workmen about seventy-five. Box 518, AMERICAN MACHINIST.

INDIANA

Wanted—A chief inspector by a large automobile company in Middle West; must have had extensive experience as an inspector in a position of responsibility; good salary and steady employment to the right man; none but high class energetic man need apply. Box 447, AMERICAN MACHINIST.

IOWA

Wanted—Draftsman, experienced in designing dies for heavy machine work; prefer one acquainted with hydraulic machinery. Box 357, AMERICAN MACHINIST.

NEW JERSEY

Wanted—A first class machinist with some capital to go into the business of manufacturing a new machine for fluting columns; invention is fully protected by patents and possess many valuable features which cannot help but carry it to success. For full particulars address P. O. Box 924, Orange, N. J.

NEW YORK

Wanted—An elevator inspector in New York City by a liability insurance company. Address "Elevator," Box 515, AMER. MACHINIST.

Wanted—Mechanical draftsman, who has had experience in designing woodworking machinery; A-1 man required; state age, experience and reference. Box 492, AM. MACH.

Toolmaker Wanted—In New York City, A-1 workman on jigs, special tools, etc.; steady work, good wages; give age, wages required and experience. Address A. J. Kimball, Box 511, AMERICAN MACHINIST.

Wanted—First class toolmaker on forming tools for automatic wire forming and four slide machines; one who can design his own tools and take care of four slide machines, preferred; state age, experience, references and wages expected to "Automatic," P. O. Box 32, Buffalo, N. Y.

Wanted—Superintendent for long established company manufacturing machine tools of high grade; must be competent to take full charge of machine shop and foundry and direct the designing of special fixtures and new tools; state fully, experience, education, age and salary. Box 513, AMER. MACHINIST.

Wanted—A factory clerk from 25 to 30 years of age; must have some mechanical knowledge and understand blueprints; to the right person, and one that can come well recommended, it will be a good opportunity. Address in own handwriting, stating your qualifications and reference. Box 514, AM. M.

Wanted—Foreman machinist; first class man in shop in Greater New York; capacity thirty men, modern tools, manufacturing and special machinery. Address, giving experience, age and salary expected, J. B. Cohrs, Box 512, AMERICAN MACHINIST.

NORTH CAROLINA

Wanted—Die machinists, experienced in making dies for forming and drawing decorated tin; steady and permanent employment, at good wages, in a progressive southern city, situated in the healthful Piedmont climate of North Carolina. Address with references, Drawer No. 36, Winston-Salem, N. C.

OHIO

Experienced tool dresser and steel hardener. Box 506, AMERICAN MACHINIST.

Wanted—First-class lathe hands; state age and experience. The Heisler Co., St. Marys, O.

Wanted—Works manager for a plant building special machinery; have foundry, sheet iron shop, machine shop and woodworking machinery; employ 350 to 500 men; want man capable of taking entire charge of manufacturing; a good opportunity. Box 531, AMERICAN MACHINIST.

Wanted—First class machinists, toolmakers, die sinkers, lathe, planer, drill press, screw machine, boring and milling machine operators, wood and metal patternmakers, brass polishers, buffers, finishers, millwrights, hammermen and blacksmiths, who wish to increase their opportunities, to register with the free Employment Department of the National Metal Trades Association, New England Building, Cleveland, Ohio.

PENNSYLVANIA

Several draftsmen wanted; applications solicited from men with either ordnance, mechanical-electrical, or mechanical structural experience; state fully, age, experience, education and salary expected. Box 429, AM. M.

The Monotype School is maintained to train young men to meet the constant demand for operators of our type casting and composing machine; these operators do so well that we receive more applications for places than can be filled; these qualifications carry most weight: Common sense, automatic machinery experience, printing office experience, type foundry experience. Full particulars will be furnished to inquirers who furnish the same information about themselves, and mention this paper. Lanston Monotype Machine Co., Philadelphia.

FOREIGN

Wanted—Machine shop foreman who is uptodate in modern steam and water boilers and radiator manufacturing; must understand the business thoroughly and be wide awake; good opportunity for young, energetic Scandinavian wishing to go to Sweden; advise age, experience, present and past employment; give references; only sober and competent man will be employed. Address "H 311," S. Gumaelii, Annoncebureau, Stockholm, Sweden, t. b. f.

SITUATIONS WANTED

Classification indicates present address of advertiser, nothing else.

CONNECTICUT

An A-1 tool room foreman; excellent reputation; expert on tool and die work; thoroughly experienced in manufacturing by uptodate methods and installing labor saving devices. Box 475, AMERICAN MACHINIST.

Mechanic, experienced as foreman and superintendent, of proven ability to reduce costs and improve product, especially on medium and small, accurate interchangeable work, is open for engagement. Box 497, AM. MACH.

ILLINOIS

Works manager or superintendent wants position with engineering works; thorough knowledge of and wide experience in modern manufacturing methods. Box 507, AM. MA.

MASSACHUSETTS

Mechanical engineer, technical school graduate, with seven years' practical and two selling experience, desires position; purchasing department preferred. Box 532, AM. MA.

A widely experienced mechanical man, temperate, accurate, energetic, practical machinist, first class designer on light and heavy work, such as jigs and fixtures, punch and dies, textile, shoe and rolling mill machinery, etc., also experienced in hiring and handling help, desires a change, and would accept a satisfactory position anywhere in America. Box 516, AMERICAN MACHINIST.

NEW JERSEY

Experienced mechanical engineer and designer of printing and automatic paper feeding machinery, open for engagement. Box 533, AMERICAN MACHINIST.

NEW YORK

First class mechanic on experimental work and special machines, wishes position. Box 530, AMERICAN MACHINIST.

Wanted—By foreman, successful in producing first class work at satisfactory cost in gasolene and fuel oil engine, desires change. Box 508, AMERICAN MACHINIST.

Foreman, 34, at present employed, desires change; high inventive ability; medium or heavy work, electrical or general machinery; references from present employer. Box 517, AMERICAN MACHINIST.

Master mechanic, experienced in designing special machinery and now employed by large automobile concern, desires position as superintendent; can give excellent references. Box 509, AMERICAN MACHINIST.

Steam hammer expert, who has had practical and successful experience, can handle engineering and sales end of this or steam-hydraulic presses, would make change if better than present connections. Box 471, AM. M.

A competent mechanical draftsman with shop experience and good knowledge of uptodate methods on interchangeable work, including gun, typewriter and special machinery; will consider a responsible position; age 29. Box 521, AMERICAN MACHINIST.

Mechanical engineer, with 18 years' experience in general machinery, power plants and equipment for industrial works, will be open for engagement May 1, desires position as superintendent of shops or New York City representative of works. "Capable," Box 510, AMERICAN MACHINIST.

First class tool and die maker; machinist, large practical experience, requires working position; smart and active, a hustler; age 36; tools, dies, jigs, gages, molds, automatics, well up in adapting machines for work requiring high speed steel expert; held position in England as instructor and speed man 10 years; good organizer and work producer; salary, $25-$30; A-1 American and English references; used to very close work. Box 522, AMERICAN MACHINIST.

OHIO

A general foreman in the machine and engine line, now holding such a position, desires a change; a shop desiring piece work preferred. Box 472, AMERICAN MACHINIST.

Cost accountant, thoroughly acquainted with systems for metal-working concerns; can install, revise or supervise cost system; best references. Box 528, AMERICAN MACHINIST.

Situation wanted as overseer of shop methods; eight years' factory experience, including stock keeping, time (piece work and profit sharing) and scheduling work; age 32. Box 529, AMERICAN MACHINIST

PENNSYLVANIA

A-1 tool and jig designer, six years' experience, capable of taking charge and producing results; references; 26 years of age, married. Box 479, AMERICAN MACHINIST.

Mechanical draftsman, age 21, two and one-half years' electro-mechanical experience with highest class companies, desires change; small company preferred; moderate salary. Box 494, AMERICAN MACHINIST.

Mechanical engineer seeks position as master mechanic or superintendent; seventeen years' varied experience; uptodate on modern methods; good organizer and systematizer. Box 526, AMERICAN MACHINIST.

General manager, superintendent, production specialist; over 20 years' machine shop, foundry and office experience on interchangeable system of tool, machinery and mechanical specialty manufacturing; age 37; references. Box 483, AMERICAN MACHINIST.

VERMONT

Position as foreman desired by all-around machinist and toolmaker; age 27; good education; 10 years' experience in jobbing and manufacturing shops; good knowledge of drafting and designing, also fair knowledge of foundry work; can handle men; East or Middle West preferred. Box 456, AM. MACH.

FOR SALE

For Sale—Bound volumes of AMERICAN MACHINIST of 1906, 1907, 1908, 1909; brand new condition; two volumes each year. Box 504, AMERICAN MACHINIST.

For Sale—Various lots of high speed metal slotting saws and cutters, all special sizes; send in your specifications; can make very attractive prices. Stewart & Clark Mfg. Co., Chicago.

An opportunity to start a machine shop; we offer one of our departments for sale, the one used to establish our business; it is small and profitable work, but as we are devoting ourselves to heavier work, we offer to sell for $2000, all the drawings, patterns, and stock of finished and partly finished parts and rough material (inventories over $3000), circulars, electrotypes, special machinery and fixtures, and an established trade. Address Sipp Machine Company, Paterson, N. J.

Talks With Our Readers

By The Sales Manager

AMERICAN MACHINIST—

I inclose herewith $4.00 for renewal of my subscription for one year from Feb. 2 issue. In filling out the inclosed blank I notice you want the name of the concern I work for and the position I hold. I have given this information, feeling sure that you will only make a proper use of it. Yours truly,

Newark, N. J. J. E. D.

The confidence of our readers is our greatest asset.

* * *

We want to reiterate that when a subscriber gives us his name, address and other information it is for our own use and for no other purpose.

We have no interest in any list that is harmful to the men in the industry.

Our excuse for living is to help, to be of service, to build up, and the alert, progressive, intelligent, cost-reducing, labor-saving, thinking men in the field appreciate this.

We want to know the positions occupied by our readers and the class of work they are engaged in for two reasons—

If you are a manager, superintendent, foreman—work in an automobile-making shop, textile-machinery plant, any particular kind of machine shop, our editors want to know it so they can publish articles that will be of special interest to you, at the same time getting articles of general interest to all.

It is our purpose to give you what you want and need.

* * *

And then, too, our advertisers sometimes ask us for a detailed classification of our list.

We have always advocated the fullest publicity regarding circulation.

We publish in each issue on our editorial page the actual number of copies printed each week.

Our books are always open to any interested party for a verification of these figures.

We will probably never be able to tell exactly to whom the news companies sell their copies. They sell them because they buy only what they have calls for—we don't take any copies back.

But we will in time, with your help, know the positions held and the class of work done by each of our readers on our subscription list.

Then we will be of more assistance to you, can give you a paper more suited to your particular needs.

Of course we realize that the nominal purchasing official of machine-shop equipment may have much, little or none of the actual selection.

But the man who does influence or make the selection may be found in almost any position.

That's the man that the manufacturers want to reach—that's the man that can best be reached through the selling section of his favorite technical paper.

It automatically attracts him because he wants to know and does know what is going on in his line.

And he reads the editorial and selling sections of his technical paper to find out.

* * *

Only reliable products can be continuously advertised.